1721

June 1929

Electrical Manufacturing

Vol. 3 A Gage Publication No. 6

A typical harness manufactured to the specifications of a leading manufacturer of radio sets.

A radio power unit cord equipped with the Belden Soft Rubber Plug, "The plug unbreakable for things electrical."

Belden Hookup Wire furnished with Colorubber or braided insulation in a variety of colors.

Belden Terminals are supplied in many styles to meet every radio requirement.

A Rubber Insulated Voice Cord for radio speakers, furnished to manufacturers.

Coil of Beldenamel wound by Belden for manufacturers of dynamic reproducers.

A Complete Wire Service for Radio Manufacturers

MAGNET Wire in a great variety of sizes and insulations; Flexible Lead Wire for many uses; Colorubber Hookup Wire in a large assortment of colors; Special Wiring Harness built to order; Cords cut to specifications and equipped with the Unbreakable Belden Soft Rubber Plug; Special Bakelite Moldings; Coil Windings to order; and Reproducer Cords made to specifications, are some of the items Belden is supplying to many leading manufacturers.

The extensive list of set manufacturers who purchase their wire requirements from Belden is significant proof of the quality of Belden Radio Materials.

Valuable experience accumulated by the Belden Engineering Department in the development of special wires, harnesses, coil windings, and similar products, is at your service.

Correspondence regarding your wire problems is invited.

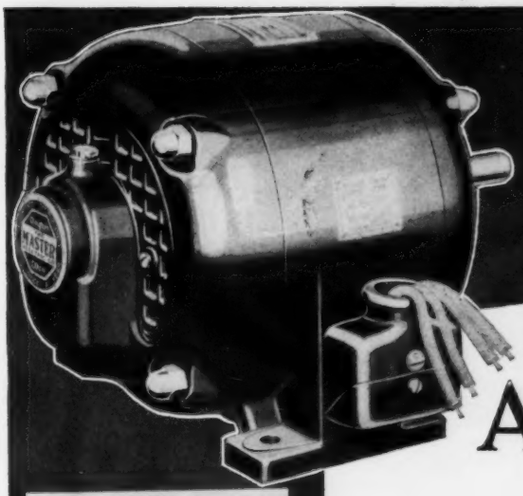
BELDEN PRODUCTS

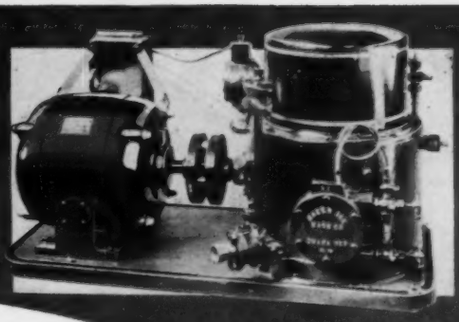
Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold
(Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

Belden Manufacturing Company

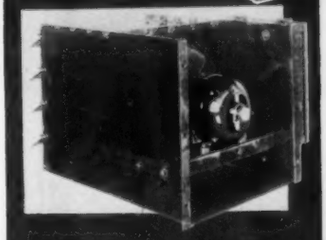
2310-B South Western Ave. Chicago, Ill.

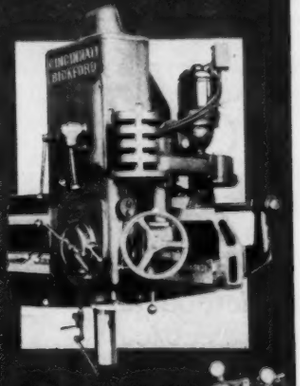
Specify Belden

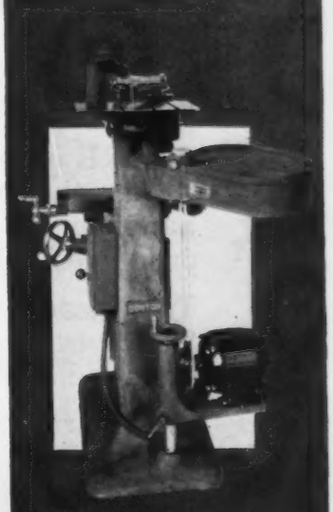


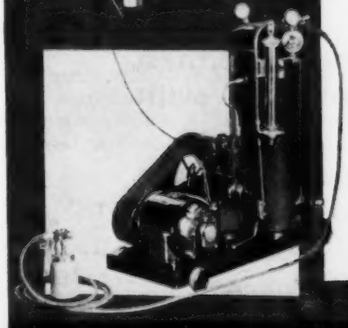


At *Your* Service









AT your service is a closely knit, competent organization of several hundred executives and employees, trained to efficiently supply your needs as a buyer of small motors.

At your service is a plant (occupying seven large buildings with more than six acres of floor space) equipped to give you production in any quantity you may need.

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At your service are complete research and engineering facilities for helping you secure correct motor installation and for developing special applications quickly. Our research engineers are trained experts with years of practical field experience.

At your service is the same quality of product that keeps several hundred manufacturers of motor-driven machinery using Master Guaranteed Motors continuously, year after year.

These facilities can serve *you* . . . why not investigate?

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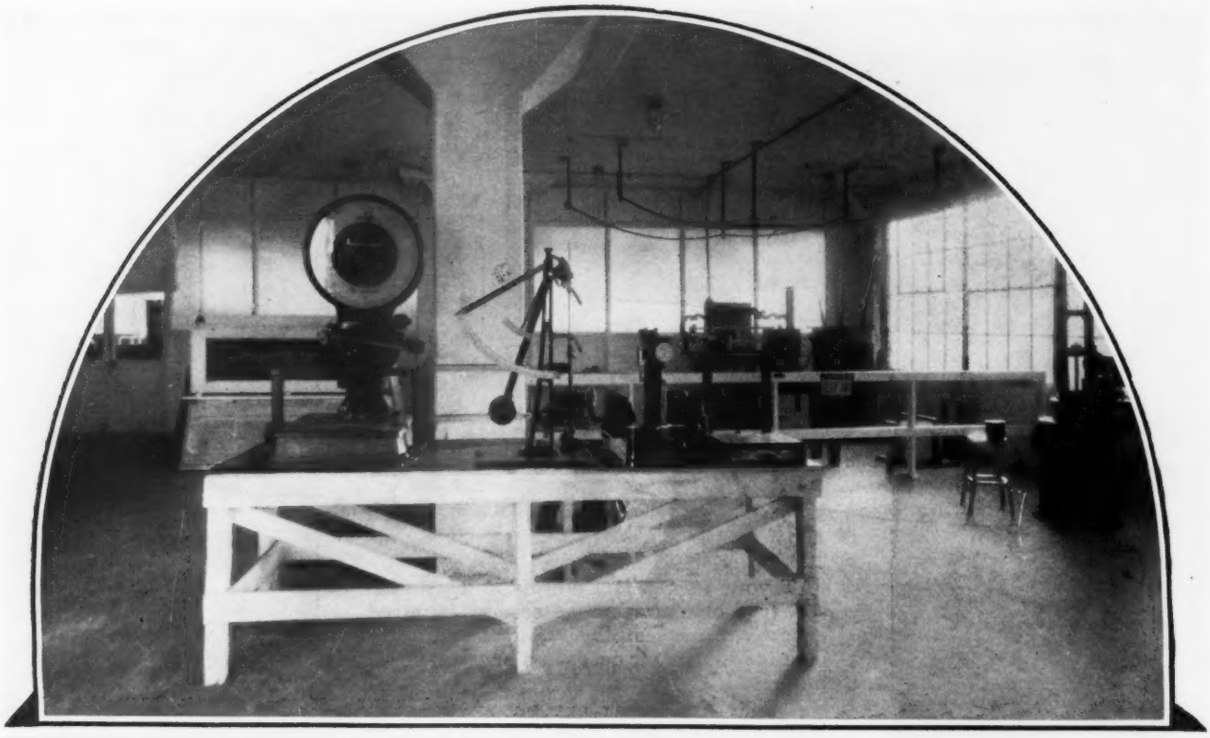
Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

More Than 70 Service Stations

MASTER GUARANTEED MOTORS

1/20 TO 10 H.P. Dayton THE MASTER ELECTRIC CO. Ohio **Less than 40°**



HEADQUARTERS *for* Laminated Insulation!

HERE is some more of the apparatus which is kept busy testing the results of different formulas and different methods of handling . . . . as they show up in the physical and electrical properties of Formica.

This steady effort at improvement has been going at Formica for 15 years. And there has been steady improvement . . . with once and a while a big noticeable step forward.

The effort has built the largest plant in its industry; with the largest and most specialized organization making just one product. You can expect quality, uniformity and service from Formica.

Send your blue prints for quotations on your insulating parts.

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4638 Spring Grove Avenue Cincinnati, Ohio

FORMICA

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 3 **JUNE, 1929** **Number 6**

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William W. Baxter, *Associate Editor* — Roger L. Knight, *Associate Editor*

Irwin Robinson, *News Editor* — Edward H. Dutcher, *Production Editor*

Electrical Manufacturing's editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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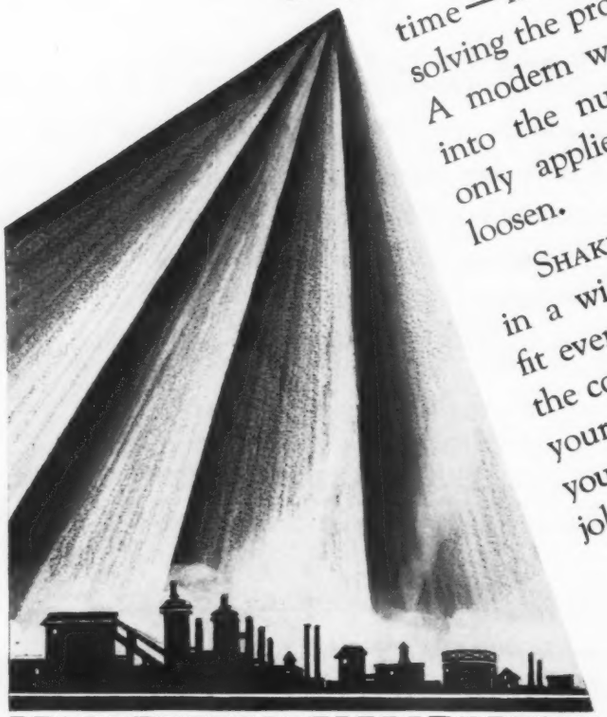
UNDER the whip of modern production—no time to waste—the finest possible job in the shortest possible time—here is where SHAKEPROOF is solving the problems of modern industry. A modern washer with teeth that bite into the nut with a grip of steel that only applied force with a wrench can loosen.

SHAKEPROOF Lock Washers are made in a wide variety of types and sizes to fit every need of modern industry. Mail the coupon below for samples and make your own tests. SHAKEPROOF can save you time and money and assure a better job on your production line.



Type 11 External

Type 12 Internal

Type 20 Terminal

U. S. PATENTS 1,419,584; 1,604,122; 1,697,954. OTHER PATENTS PENDING. FOREIGN PATENTS.

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Please send me samples of

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[Division of Illinois Tool Works]
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GAIR FOLDING CARTONS

THE other day, a visiting customer at the Gair Folding Carton Plant at Piermont, New York, after strolling through a mile of departments, commented most gratifyingly on the great variety of merchandise for which he saw Folding Cartons undergoing manufacture.

If he had complimented on the modernity of the plant, the speed of the equipment and the straining for quality he had observed, it would have signified the honest politeness of the visitor. But our customer saw something that was the outgrowth and result of these conditions—a service in Folding Cartons for every conceivable merchandising purpose and of every color scheme and grade.

It requires long experience to turn out Folding Cartons with the sureness of success in such variety, dissimilarity and for so many purposes. We have been practical in Folding Carton construction and designing for sixty-five years.

ROBERT GAIR COMPANY
420 LEXINGTON AVENUE, NEW YORK, N. Y.

GAIR FOLDING CARTONS

A FLOOD of shadowless light from across the broad Hudson, along which the Piermont Division, the specializing plant in Gair Folding Cartons, extends for one-half mile, assists the meticulous inspection, the fine color match and registry of the printing and lithography performed there. The personnel of this Folding Carton Plant is production proud. Every natural and artificial means for enlarging this pride is employed. At night, the last scientific substitution for daylight is used and throughout the latest means for carrying off inevitable dust, which injures press work, as well as a system for preventing materials in process being changed by humidity, protect Gair standards.

The development of the Folding Carton begins in the pulp in the Paper Mill's beaters. It moves in a band of box board, which takes the character that will best and most economically serve in making your Folding Box. There is no guess-work. It moves on over the printing or lithographing presses and beyond the various processes that lead to the cars for shipment. The output of the Piermont Division in Folding Cartons is of conspicuous variety. The five Gair Box Board Mills, with a capacity of more than one thousand tons per day, turn out every required quality, finish and color necessary to this variety. Our Creative and Design Department supplies both experience and inventiveness for artistic and structural design for any new cartoning purpose—or for the careful freshening of unmodish Folding Boxes that face the danger of being left behind by the times.

ROBERT GAIR COMPANY

420 LEXINGTON AVENUE, NEW YORK, N. Y.

YOU

may be just the man who can use

BOHNALITE

62% LIGHTER THAN IRON

Many men believe they must continue to use iron in the products or merchandise they make merely because they have always done so.

As a rule, these same executives are not familiar with the economical advantages of Bohnalite.

Are you?

You may be just the man who can use Bohnalite to advantage.

For here is a metal 62% lighter than iron—possessing all the advantages of iron but none of its disadvantages.

Bohnalite has high uniform hardness—great density—fine grained structure—exceptional strength—excellent bearing qualities—and is ductile.

Many of these important refinements are due to the special processes and series of heat treatments developed by Bohn metallurgists over a long period of years.

Why not send us your blue prints and samples. Let us figure with your engineers and show you the many advantages of Bohnalite, a new light alloy.

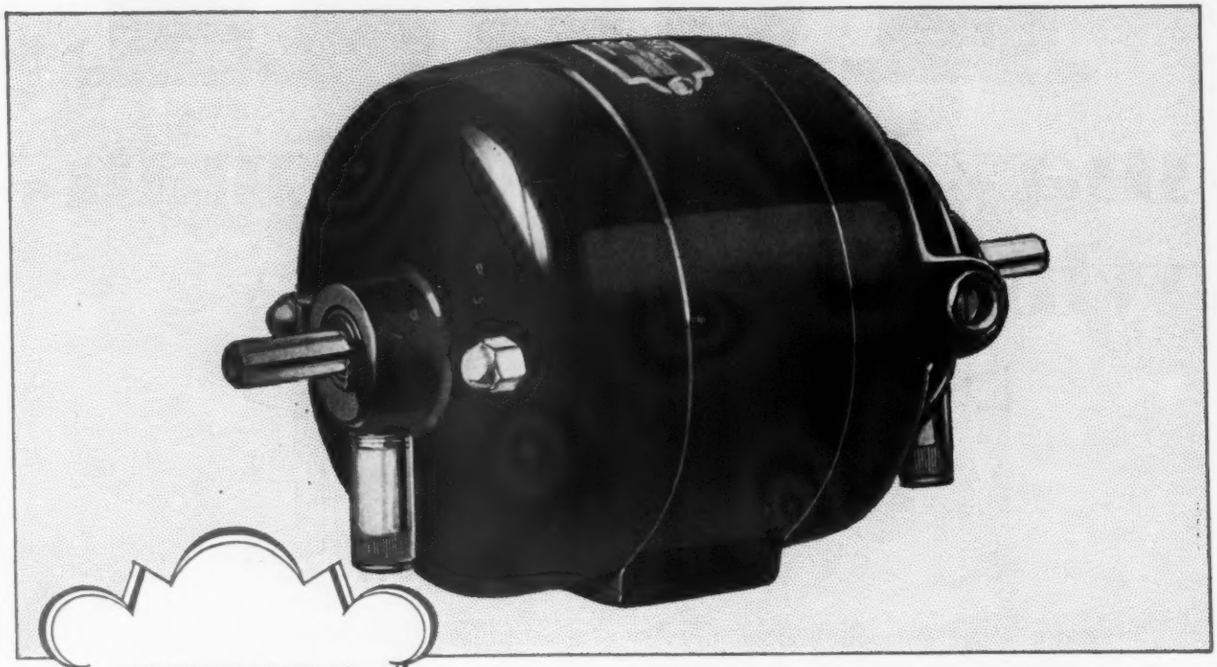
Send us your blue prints and ask for the latest Bohnalite booklet.

BOHN ALUMINUM & BRASS CORPORATION, DETROIT, MICHIGAN

New York Chicago Philadelphia Cleveland Pittsburgh

CHAS. B. BOHN
The authority who developed Bohnalite

a Dumore



DUMORE MOTORS *are used in*

Electric Vacuum Cleaners
Electric Floor Polishers
Sewing Machines
Oil Burners
Grinders
Drills
Drink Mixers
Dental Engines

Motors that Stay "Active"!

REGARDLESS of the service, Dumore Fractional Horsepower Motors give the *same, steady, dependable power.* They are made to do exactly that . . . they are designed and built to more economically cope with the power demands of numerous devices . . . they are accepted for their longer years of *active service.*

In their construction, the highest standards are employed . . . only skilled hands assemble them . . . the benefits of 25 years of *motor-making* reflect themselves in Dumore performance.

Every Dumore Motor is *fit* . . . each armature is dynamically balanced, eliminating all vibration, assuring smooth, quiet operation.

Dynamic balance of Dumore armatures is secured on special balancing machines of our own design and construction. Smoothness, quietness and reduction of bearing trouble to a minimum are thus assured in all Dumore Motors.

DUMORE

motor keeps this sign "ALIVE"

CROWDS congregate where there is *action.* They are attracted by the moving, flashing object . . . they respond to electric signs.

That is exactly the finding of The Davis Bulletin Co., Inc., of Buffalo, N. Y., who manufacture a window and pedestal sign *. . . a sign that is alive . . . for it is powered by Dumore Motors.*

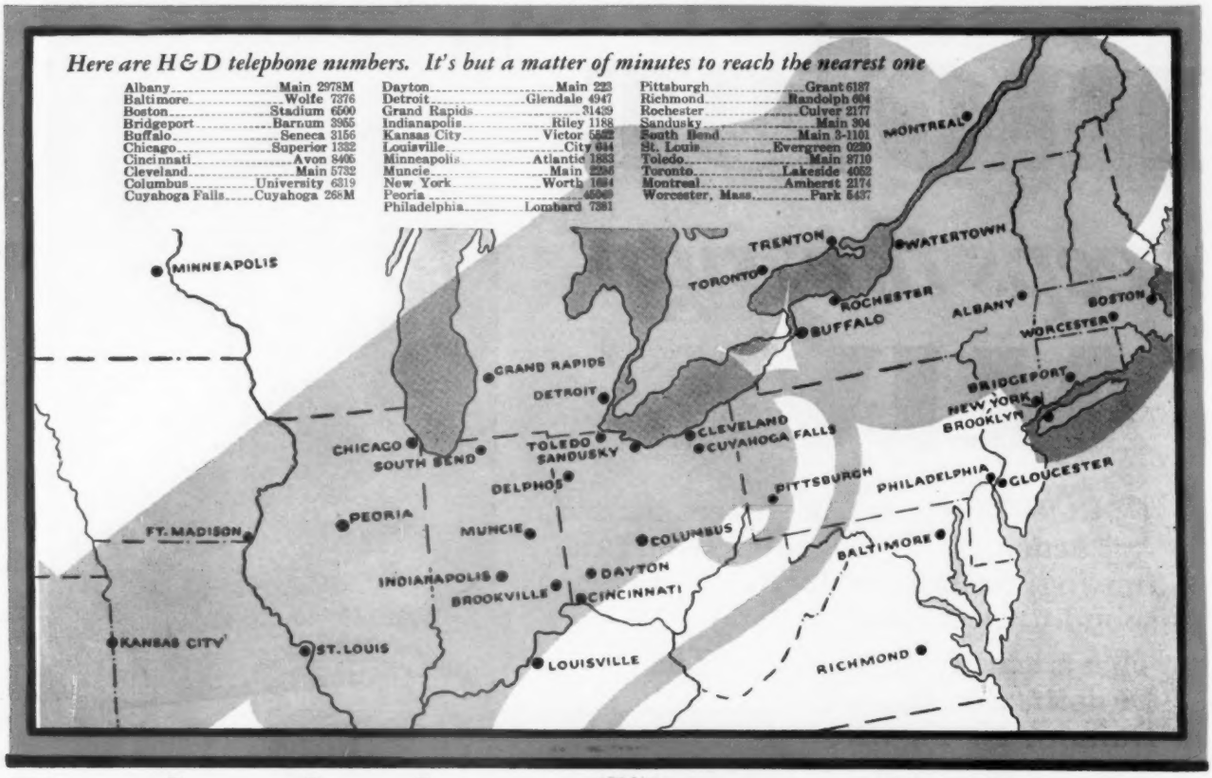
Continuous Display Stands on which the Dumore Fractional Horsepower is used, manufactured by The Davis Bulletin Co., Inc., of Buffalo, N. Y.

While this application is unusual, it is potent. The life, the spark of this type of sign becomes the duty and responsibility of the motor. It must furnish constant, unfailing power . . . it must give action to the subject . . . it must *draw the crowds.*

This is but *one* of the various industries satisfactorily served by Dumore Motors. They are obtainable in speeds of from 10,000 to 12,000 R. P. M. For full details, and how efficiently Dumore Motors will work when applied to your product, write our Engineering Research Department.

THE DUMORE COMPANY
35 SIXTEENTH STREET RACINE, WISCONSIN

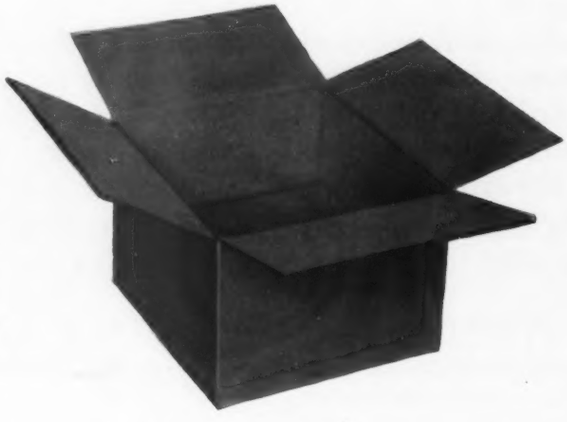
FRACTIONAL HORSE POWER MOTORS ARE DYNAMICALLY BALANCED!



In the shadow of your telephone. .

Right at your elbow stands the gateway that will place you in touch with the world's largest packaging service in a few minutes' time. The gateway is your telephone.

For within three or four minutes telephone reach of any point in industrial North America is a Hinde & Dauch service unit — a unit that is ready to give immediate attention to your packaging needs.



Call the nearest H & D station whenever you have a packaging problem to solve. If the 50 Hinde & Dauch package engineers do not have the answer already, they will cheerfully work it out for you, without obligating you in the least.

"Engineered Packages in the Electrical Industry" is an interesting booklet that shows how H & D Engineers have solved the packing problems of scores of manufacturers. Send the coupon for a free copy.

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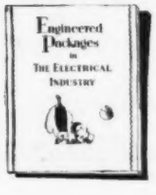
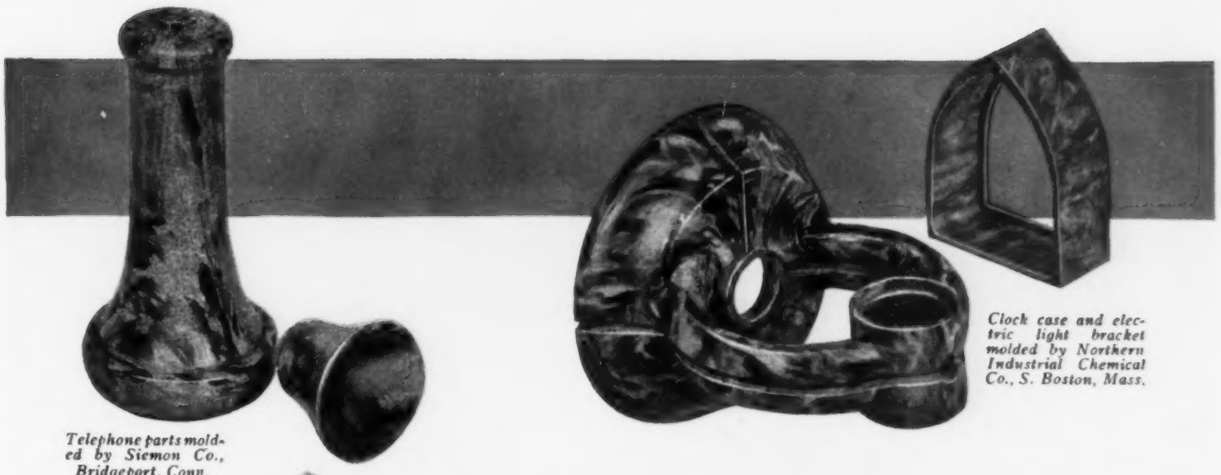
325 Decatur St., Sandusky, Ohio

HINDE & DAUCH *corrugated fibre* SHIPPING BOXES

H&D

THE HINDE & DAUCH PAPER CO., 325 Decatur St., Sandusky, Ohio
Please send a copy of "Engineered Packages in the Electrical Industry."
Name .....
Address .....
City ..... *State* .....
Business .....





Telephone parts molded by Siemon Co., Bridgeport, Conn.

Clock case and electric light bracket molded by Northern Industrial Chemical Co., S. Boston, Mass.

Switch plates molded by Allen & Hills, Inc., Auburn, N. Y.

Automobile parts and gasoline tank cap molded by General Industries, Elyria, Ohio.

Cigarette humidor and powder jar molded by Colt Patent Fire Arms Mfg. Co., Hartford, Conn.

NOW *for the first time,* **COLOR!** *in the entire range, can be had in your molded products*

. . . new beauty, inimitable mottles of any color blending; rich, true pearl effects . . . LUMARITH provides these plus an appeal to modern tastes and demands. LUMARITH may be had in either transparent, translucent or opaque and it offers limitless possibilities in the molding of a thousand things . . . it is the most versatile of molding ✻

CELLULOID CORPORATION
58 West 40th St. New York, N. Y.

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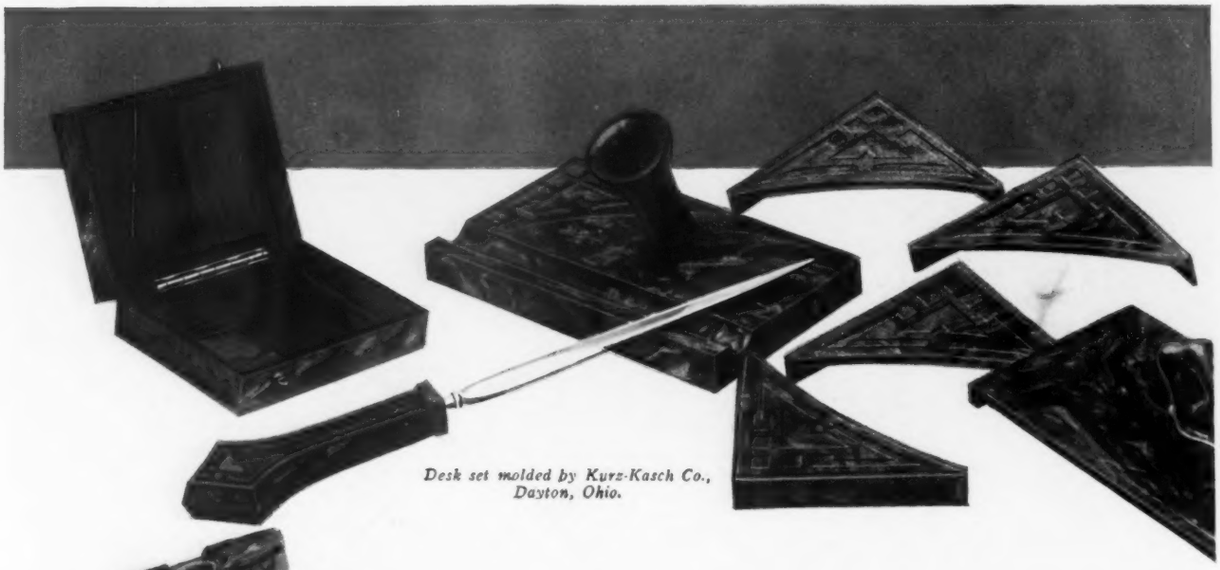
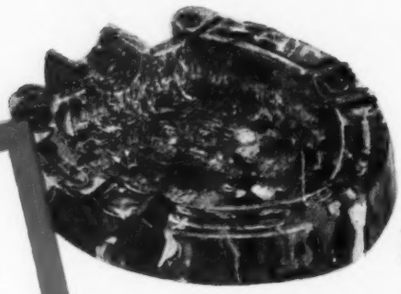
AMERICA'S MOST COLORFUL MOLDING MATERIAL



Desk set molded by Kurz-Kasch Co., Dayton, Ohio.

Lighter cases molded by Auburn Button Works, Inc., Auburn, N. Y.



Ash tray molded by Kuhn & Jacob Machine & Tool Co., Trenton, N. J.

✻ materials. It is unbreakable; doesn't crack; can be cleaned with a damp cloth and it is substantially non-inflammable.

LUMARITH is everything you have wished for as a material that combines lasting, appealing beauty with unusual "mold-ability."

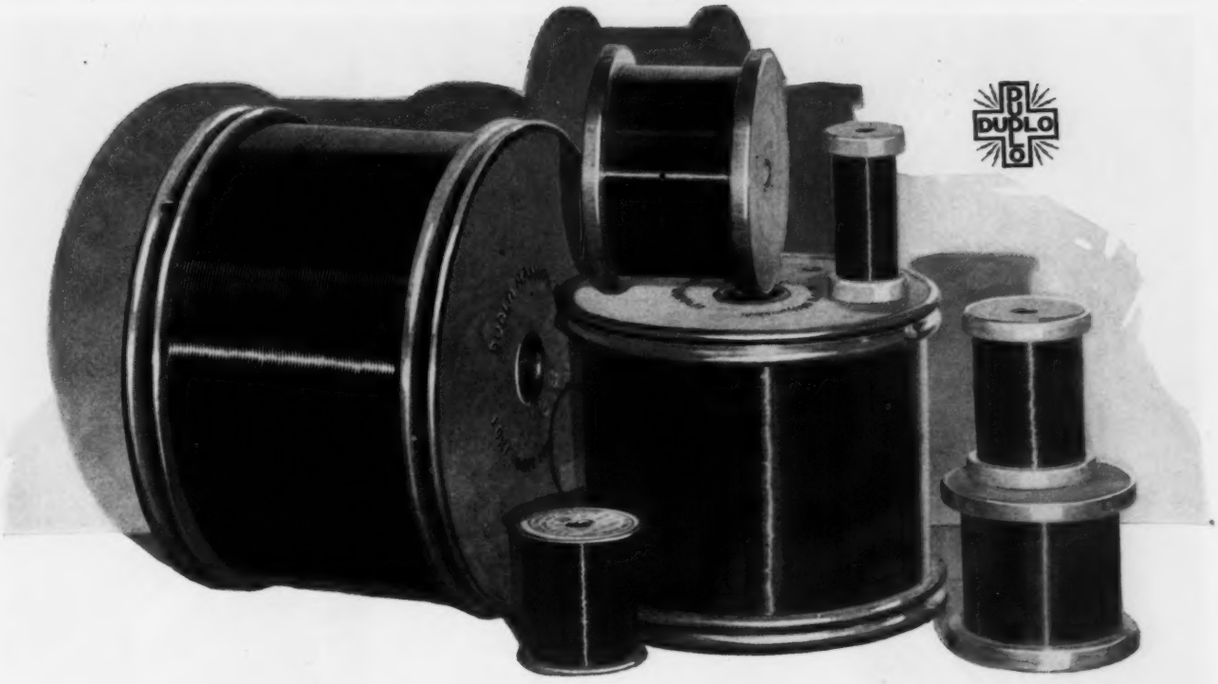
Whatever you are now having molded, remember that LUMARITH will add greater beauty and value to it.

CELLULOID CORPORATION
58 West 40th St. New York, N.Y.

Electric lamp shade molded by Northern Industrial Chemical Co., S. Boston, Mass.

LUMARITH

AMERICA'S MOST COLORFUL MOLDING MATERIAL



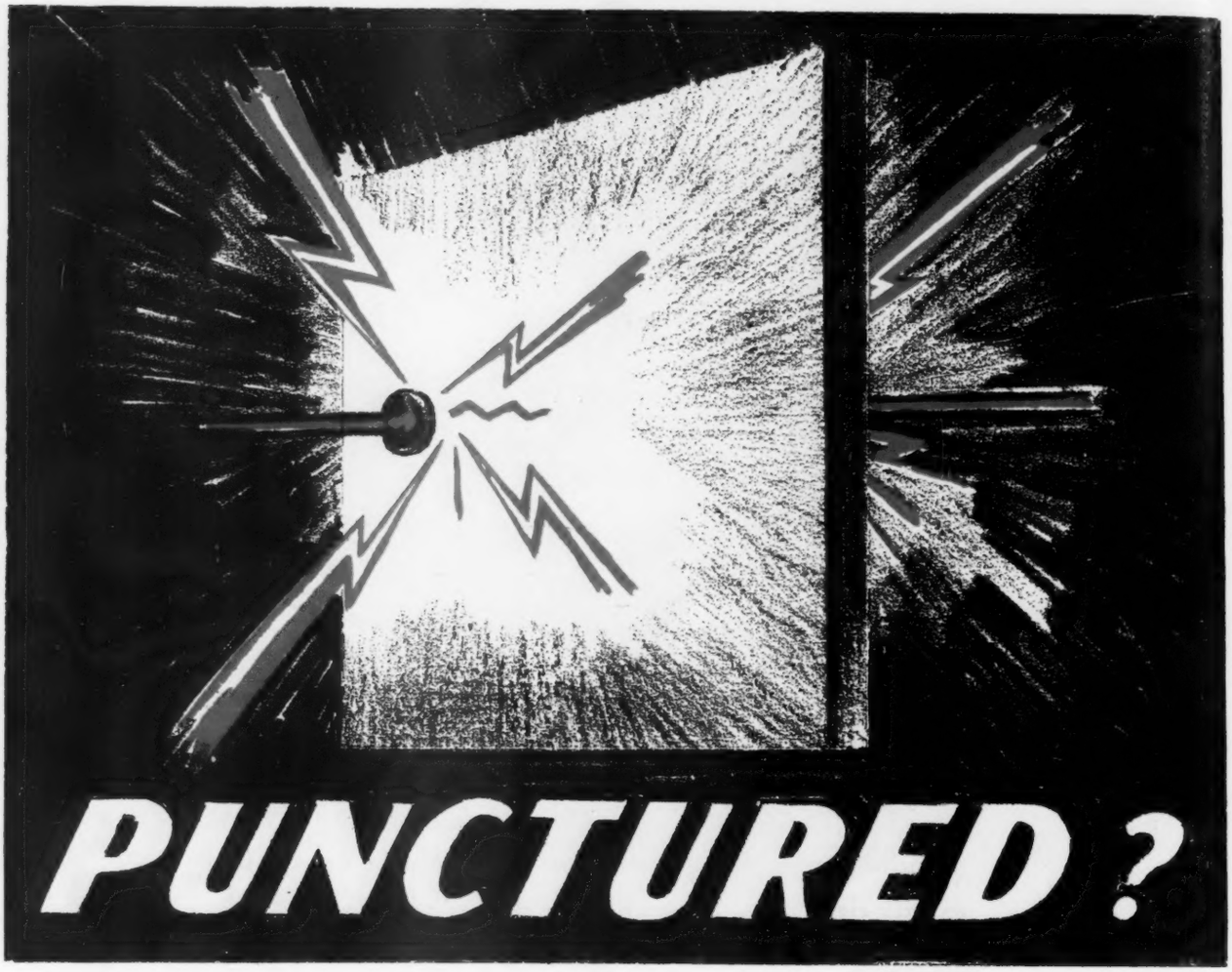
Tested and Tested and Tested

Dudlo Enameled Wire just can't help being right—exactly right . . . Through each succeeding process of fabrication, drawing, annealing, enameling, and the final spooling, its life is just one test after another . . . It must pass tests on adherence of the enamel to the copper. The enamel dare not crack under severe elongation, nor on short radius turns on standard test mandrels . . . Then it must pass further tests for dielectric strength, ageing qualities, and resistance to oils and solvents . . . Even a mercury bath test is used on the smaller sizes to insure completeness of insulation . . . Here are definite reasons—sound reasons—why you can always depend on the wire when the Dudlo trademark is on the spool.

DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

DIVISION OF GENERAL CABLE CORPORATION



YES—BUT

IT TAKES 500,000 VOLTS TO DO IT!

[*with a 1 inch sample*]

The Electrical Testing Laboratories, in New York, after their exacting tests for insulation resistance, gave Panelyte a rating of 530 volts per mil, average breakdown. The maximum pressure used was 196,000 volts, which would not puncture Panelyte in the ½″ thick samples. Compare this performance with other accepted sheet insulation.

PANELYTE

THE AMAZING SHEET INSULATION

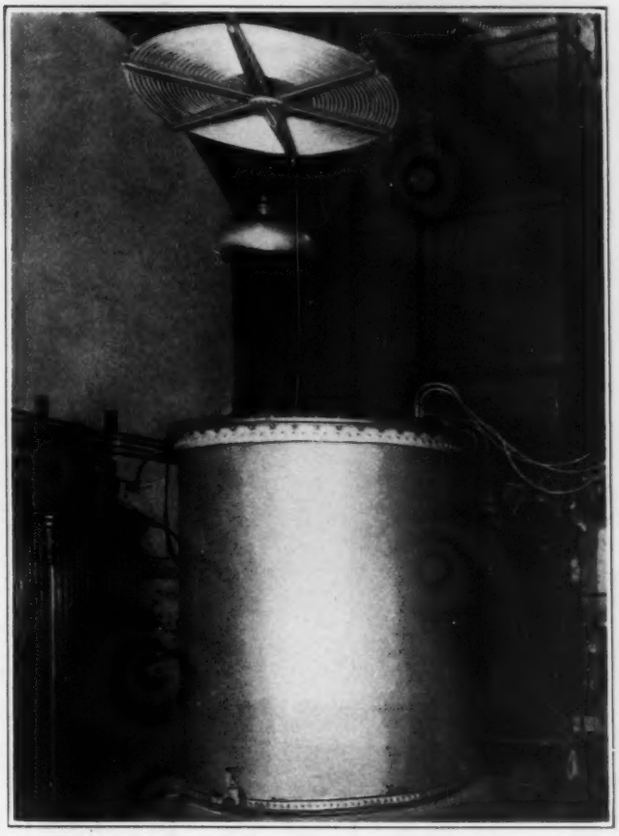
Resistance is but one of the remarkable qualities possessed by Panelyte. It has great tensile strength and a high transverse modulus of rupture. It has less than half the weight of slate and much lower weight than other panel material.

Panelyte is fire resisting.

Panelyte is the ideal material for insulation and panels, in the following products:

Power Switchboards
Electrical Instruments
Distribution Panels
Busbar Supports
Medical Instrument Panels
Electric Safety Devices
X-Ray Apparatus
Radio Panels
Industrial Control Panels
Electrical Barriers
Rheostat Bases
Electric Elevator Controls
Telephone Equipment
Radio Apparatus

High Voltage Equipment (both indoors and out)
And many other uses



PANELYTE CORPORATION
TRENTON, NEW JERSEY

Put a sample of PANELYTE *to any test. Then compare!*

SEND THE COUPON

Panelyte Corporation
Trenton, N. J.

Gentlemen: Please send me complete information and sample of Panelyte.

Name .....

Company .....

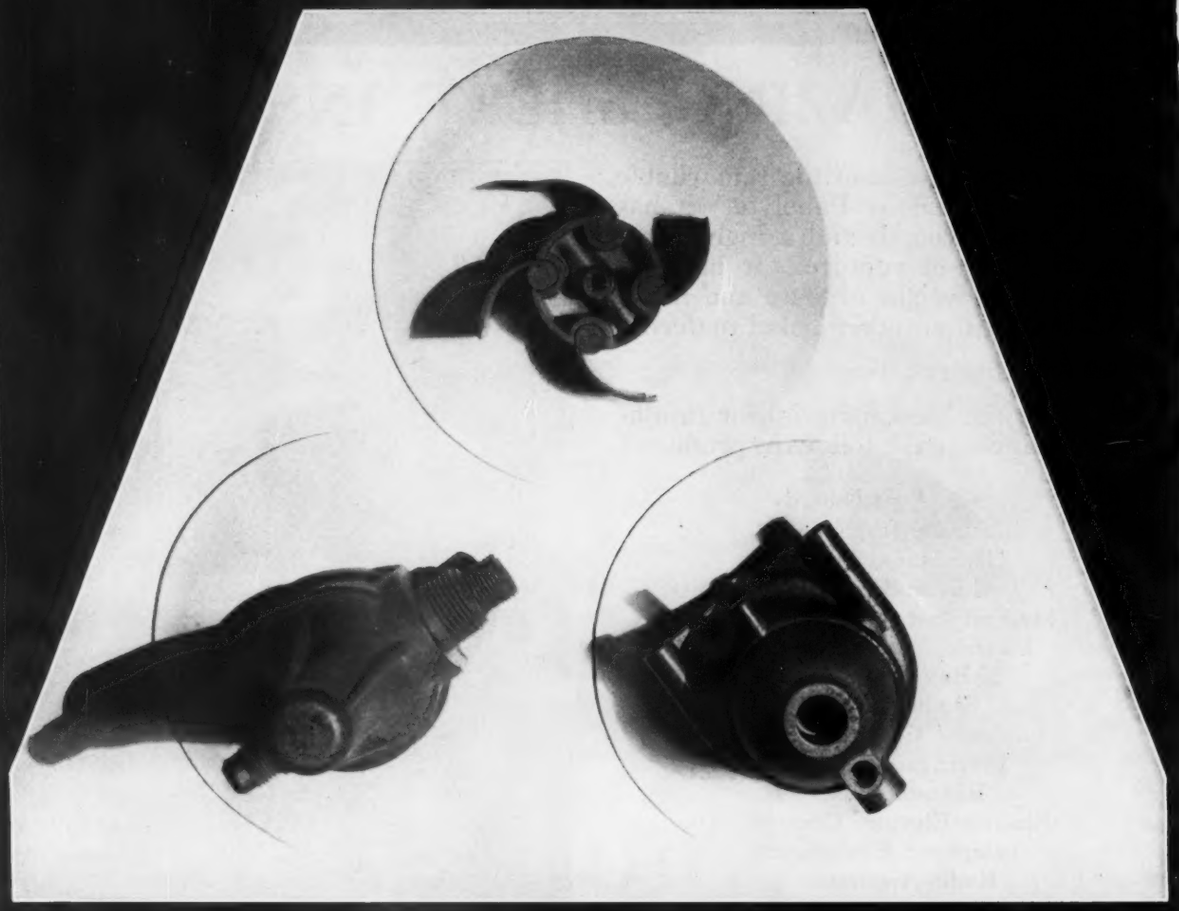
Position .....

Address .....

.....

HORSE HEAD ZINC

FOR THE DIE CASTING INDUSTRY



CASTINGS, COMPLETE WHEN CAST

Speed of production demands castings full-grown at birth. ¶ Look at these die-castings. You see threads . . . born full-grown when the mold was opened. You see unmachined parts fitting closely into other unmachined parts . . . born with close clearances. You see perfect core holes, untouched by cutting tools . . . another birthright of die-casting. ¶ You see three zinc-base die-castings born to man's estate. *Not one ever felt the growing pains of machining.* ¶ Horse Head Zinc is the base of each. These castings are as serviceable as the die-casting process is efficient. The *uniform quality* of Horse Head Zinc assures long-life castings to the user.

New Jersey zinc

THE NEW JERSEY ZINC SALES CO.

160 FRONT STREET, NEW YORK CITY

ZINC METALS AND ALLOYS - ROLLED ZINC - ZINC PIGMENTS - SULPHURIC ACID - SPIEGELEISEN

Our Straw Board Mill at Circleville, O., makes for us all the straw for corrugating used in our Corrugated Box factories.

Two Box Factories, Corrugated and Solid Fibre, and one Mill making Test Liners and Chipboard form an important group unit of our organization at Cincinnati.

Our factory at Cleveland makes corrugated containers and 98% of all Mazda Lamp wrappers in this country.

BOX FACTORIES AND MILLS
(CORRUGATED and SOLID FIBRE)
of the
CONTAINER CORPORATION
OF AMERICA
and MID-WEST BOX COMPANY
IN OHIO

THE Ohio group of box factories and mills is an important one in our industry.

Cleveland, on the north, one of the original "Consistent Quality" plants of the Mid-West Box Co. group, merged with the Container Corporation of America in 1926, is primarily notable for the fact that it produces 98% of all the Mazda Lamp wrappers made in this country. In addition however, this factory supplies large quantites of quality corrugated containers for Ohio, Michigan, Western New York and Western Pennsylvania.

Cincinnati, on the banks of the Ohio, has two box factories making Corrugated and Solid Fibre quality containers for Ohio, Indiana, Kentucky, Tennessee, West Virginia, Virginia, North Carolina, South Carolina and other Southern States. The mill supplies Test Liners and Chipboard for containers.

Our mill at Circleville manufactures straw for corrugating.

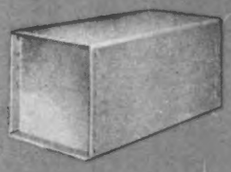
OTHER FACTORIES AND MILLS

at Philadelphia (Manayunk), Pa., Fairmont, W. Va., Charleston, W. Va., Natick, Mass. and Bridgeport, Conn., (except Chicago, Illinois, Anderson, and Kokomo, Indiana plants previously shown in this series). —

WILL BE FEATURED IN LATER INSERTS

EXHIBIT
No. 3 of a Series

A Great Variety of Goods — Fragile, Solid *and* Liquid Now Packed in Fibre Board Containers

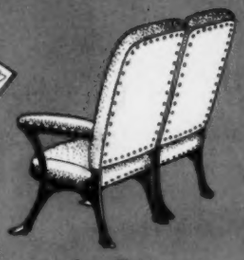


Pilferproof Recessed End Shipping Box

Matches

Shoes

Tobacco, Cigars Cigarettes



Opera Chairs

Everything in Cans

Reshipping Case for Bottles and Bottled Goods

Toys — All Kinds

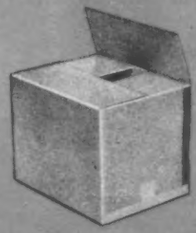
Lamp Wrappers

Electric Light Bulbs

Dry Cell Batteries

Soaps, Washing Powders and Flakes

Milk, Preserves, Etc.



Slotted Carton for all Commodities

We Offer Our Great Experience in Designing Special Boxes for Difficult Packings

THE great importance of a strong, safe properly constructed and reinforced package, so strongly emphasized by railroads, has automatically developed a Research Department within our organization of which we are justly proud. The work of this department deals with difficult packing and shipping problems of shippers and solutions that will satisfy customers and save them money. The results attained to date are to say the least, remarkable. Fragile and odd shaped products are now shipped in fibreboard boxes and delivered at destination in perfect condition—at lower cost. What are your problems? Write us for the FREE service of our Research Engineers. No obligation at all. See COUPON.

Some Industries Now Using Our Solid Fibre or Corrugated Boxes

Bakery Goods	Furniture	Shoes
Canners	Stationery	Breakfast Foods
Building Material	Lamps and Shades	Proprietary Remedies
Sporting Goods	Tobacco—all forms	Spices
Books and Magazines	Perfumery	Foods—All Kinds
Toys	Paints and Varnishes	Instruments
Crockery	Automotive	Brooms, Brushes, Etc.
Bottlers	Glassware	Ceramics
Fruit Packing	Insecticides	Leather Goods
Radio Goods	Rubber Goods	Doors
Pictures	Electrical Goods	Hardware
Vegetable Growers	Men's, Women's and Children's Furnishings	Dry Cell Batteries
Meat Packing	Millinery	Enamelware
Dairy Goods	Confectionery	Filing Cabinets
Soap and Chips and Washing Powders	Carpets and Rugs	Electric Light Bulbs
Matches		

CONTAINER CORPORATION
OF AMERICA
and MID-WEST BOX COMPANY

111 W. Washington St. Chicago, Illinois

Six Mills — Twelve Factories — Capacity over 1200 tons per day

RETURN COUPON

CONTAINER CORPORATION OF AMERICA
111 West Washington Street, Chicago

Gentlemen: Please have one of your experts check our present packing and shipping methods—without obligating us—for the purpose of reducing our costs if possible.

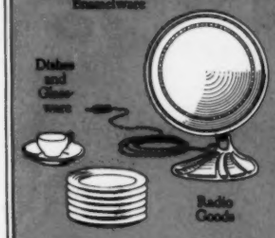
Name_____

Title_____

Firm_____

Address_____

Pottery and Enamelware



Dishes and Glassware

Radio Goods

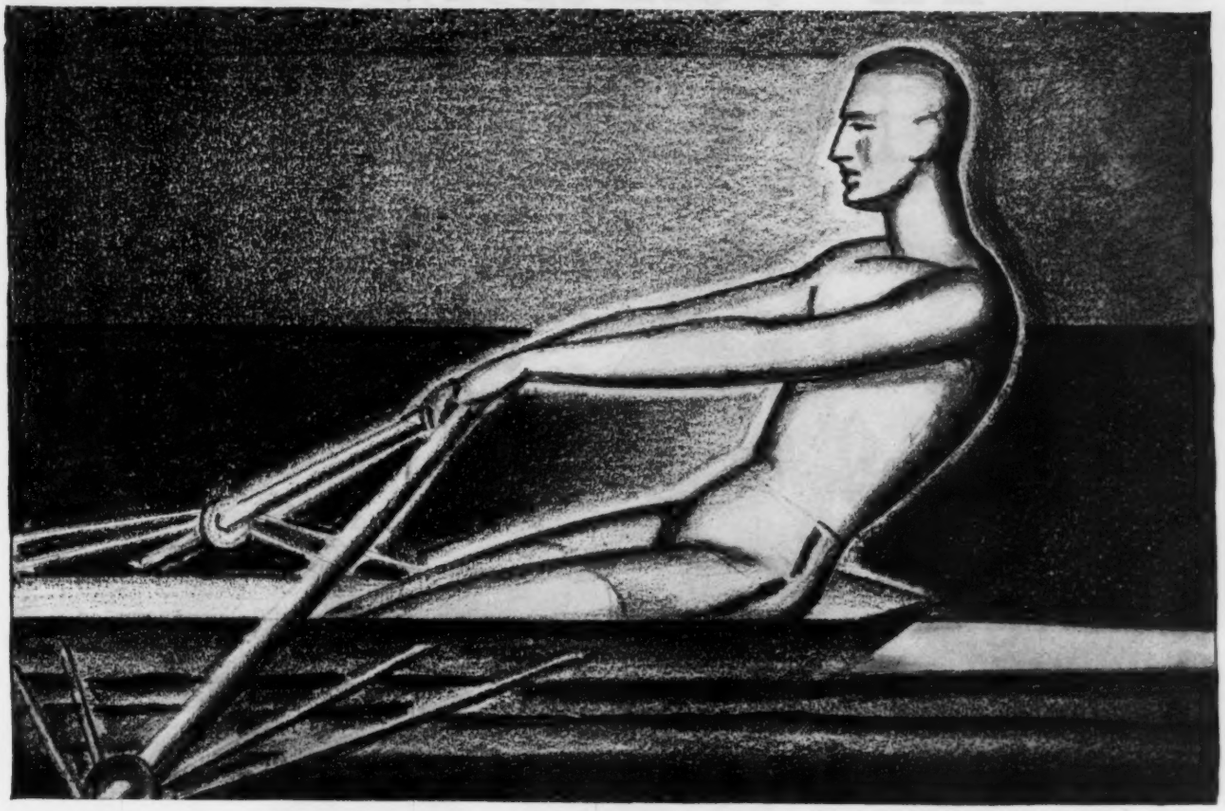
Electrical Goods

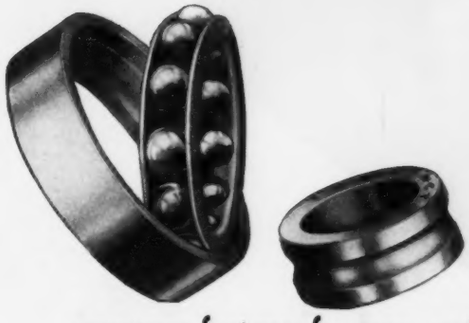
Reflectors

Enameled Tile

Wherever goods are manufactured — there you will find our boxes reducing packing and shipping costs.

SMOOTHNESS—*SPEED*





YOUR service department will have little or nothing to do, as to adjusting ball bearings, if Torringtons are made standard equipment.

Smooth performance and long life are characteristics of Torrington Ball Bearings. They are economy features for you, and for purchasers of your production.

Torrington experience and skill in precision manufacture has been applied to the construction of these ball bearings. They simplify the problem of supplying satisfactory machinery to necessarily critical customers.

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ESTABLISHED 1866
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It is far and away the most complete and enlightening book ever written on small belt drives. It contains facts and figures that cannot fail to be of decided interest and value to every engineer and plant executive.

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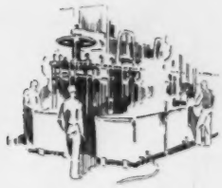
PROTECT YOUR PROFITS

Prevent rust and you protect your reputation and your profits, for it is rust that is the most insidious scourge of metal parts on land, in the air or on the sea.

Today Udylite occupies a position of leadership in the field of rust prevention. Its recognized success in adding to the long life as well as the beauty of all types of materials, the bright silver-like, rich satin finish which Udylite gives are factors in its growing popularity. If you have a rust problem to solve we would be glad of the opportunity of proving the value of Udylite and how it serves as a protector to materials and profits. Your inquiries will receive our prompt attention.



NOT A PRODUCT—BUT A PROCESS

The UDYLITE PROCESS COMPANY

Eastern Sales Office:
30 East 42nd St., New York

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DETROIT, MICH.

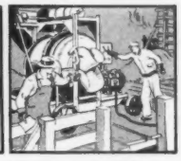
Western Sales Office:
114 Sansome St., San Francisco, Cal.

G-E Flex . . . . .

the trouble-proof electric cord

Lighting

Household Appliances

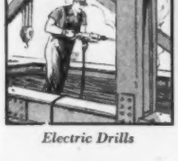


Construction Machinery

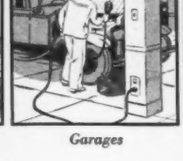
The strength and the flexibility of its cord largely control the efficiency of a lamp or an electric tool or appliance. That's why so many manufacturers are taking no chances —they're using G-E Flex, the cord that will not kink.

It is tough, too—and neither water, oil nor acid will harm it. It is all-rubber covered and extremely flexible.

You can get G-E Flex on spools or in coils. It is also available in cord sets with moulded rubber plug attached, all ready for assembly. If you want to know more about this General Electric product, just mail the coupon.



Electric Drills



Garages

Offices

Washing Machines

Vacuum Cleaners

Section W-236, Merchandise Department,
General Electric Company,
Bridgeport, Connecticut.

Please send me full information on G-E Electric Cord and Cord Sets.

Name .....

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.....

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 3 **JUNE - 1929** **Number 6**

Nema Forging Ahead

More than three hundred electrical manufacturing executives attended the spring meeting at Hot Springs, Va., and mapped out future work for divisions and sections under reorganization plan

CHANGING marketing conditions, unfair competition and price discrimination, purchasing, and cost accounting were the subjects of leading addresses made before the two sessions of the Policies Division of the National Electrical Manufacturers Association during the spring meeting of Nema at Hot Springs, Va., May 18-25. The meeting was characterized by an enthusiastic attendance of more than three hundred Nema representatives.

The first meeting of the Policies Division on May 18 was opened by President Huntington B. Crouse, who gave a statistical picture of the growth of the association and the extension of its activities. "Within the last year," Mr. Crouse said, "there has been a twenty per cent increase in membership—the number of companies now affiliated being three hundred seventy-seven. The individual representative members of Nema now number seven hundred sixty-seven. The nineteen sections reporting statistics to headquarters have now been joined by nine others as of June 1. This is a fifty per cent increase for the year.

"The section is the basis of all our association activities. Our problem when Nema was started, less than three years ago, was one of organization. We are now concerned more with the coordination of activities and in that connection it is essential that we retain and strengthen our central, legal, and managerial control."

H. B. Crouse
President, National Electrical Manufacturers Association

In a comprehensive analysis of "The Changing Scene in Marketing," James L. Madden, vice-president of the Metropolitan Life Insurance Company, stated that American business today is definitely in a distribution rather than a production era.

"With the period of deflation after 1921 came the elimination of many of the 'rule-of-thumb' sales methods," said Mr. Madden, "which were partly responsible for the condition characterized by heavy and unbalanced inventories, by speculation in commodity prices, by the lack of scientific salesmanship methods, generally speaking, and by the absence of analytical study of the facts underlying sales policies. Since then more and more time has been given to an analytical study of methods of distribution. The desire to keep active the highly-geared productive machinery has generated intense competition, not only between individual manufacturers but between whole industries. Introduction of substitutes has tended to make competition even keener. New products have been developed which compete for a share of the consumer's dollar which previously has gone elsewhere."

An interesting point brought out by Mr. Madden was the fact that through national advertising industry has educated the consuming public to a point where it in turn makes numerous and heavy demands upon production due to acquired habits of style and taste. Further, the chain store, direct selling, group buying, the automobile, high wages and more leisure, have been potent factors in raising the standards of living and changing modern distribution and marketing methods.

"In many of these phases of modern economic living, electricity has been instrumental in bringing about this transformation," Mr. Madden continued. "Industry is utilizing its inventive genius to harness electricity for the housewife's benefit, but because our domestic markets today are essentially buyers' markets, the manufacturer cannot hope to develop and sell a modern labor-saving device if the distribution and marketing meth-

Changing Scene in Marketing

James L. Madden

"CHAIN store, direct selling, group buying, automobile, high wages, and more leisure have been potent factors in raising the standards of living and changing modern distribution and marketing methods. If a manufacturer's marketing methods are not sound, he may fail in making the necessary number of sales because our domestic markets today are essentially buyers' markets."

ods are not sound." Mr. Madden went on to discuss a number of the changes in distribution and marketing methods that have been actively supported by the progressive manufacturers and wholesalers with a view to more correctly evaluating the changed public demand.

Intelligent Market Analysis Is Needed

THE following subjects were discussed in that connection:

Market Analysis—In the case of a New England manufacturer it was found that by developing a new line he was able to overcome the falling demand for his original product and to continue business with his existing personnel and machinery. In general the manufacturer who knows his markets has a big advantage over his competitors. In many instances sales appeal will vary in the sections of the country and it is such a study that often enables the manufacturer to know which are natural and which are forced markets for his products. Furthermore, an intelligent market analysis will enable a producer to more advantageously locate his branch plants.

Sales Control—Particular emphasis is being placed on sales control through future sales volume. This requires the use of sales statistics, careful study of the factors which affect sales volume and a knowledge of general economic trends.

Control of Salesmen's Activities—The study of distribution of salesmen's time has uncovered some of the most glaring wastes in the whole field of selling. One very successful firm discovered that their salesmen were spending only fifteen per cent of their time in the presence of customers. The executives then developed a plan for improving this situation, with the result that their salesmen now spend twenty-five to thirty per cent of their time with customers and the corresponding increase in sales has been realized.

Consumers' Buying Habits—Manufacturers and distributors today are attaching greatly increased importance to knowledge of consumers of the products they sell—knowing how they buy, when they buy, where they buy, and why they buy.

Sales Cost Studies—Another type of sales analysis emphasizes sales costs. Increase in sales volume may or may not be a good thing. One wholesaler upon analysis found that thirty-seven per cent of his orders amounted to less than ten dollars. These figures indicated that an order for less than ten dollars would not cover sales cost alone—to say nothing of warehouse, delivery, office and other expenses. This percentage in the aggregate amounted to only nine per cent of the total sales volume, yet the losses incidental to it had to be offset by the rest of the business. By a proper study of market costs, profitable customers can be separated from the continually unprofitable ones.

New Uses—In casting about for a means of broadening its market, a manufacturer of liquid glue for household use evolved the plan of selling glue for *making* things as well as for *mending* them. This new purpose was generally advertised with the result that the product is now widely used for making many accessories for the home.

Style and Design—Color has entered all fields of industry today. Locomotives of the Southern Railroad are dressed up in green with gold bands. Electrical household products are often employing color. Some organizations even employ specialists who have made studies of the public demand in respect to color, style and design for the purpose of properly advertising their products.

Consumer Service—Many firms have set up comprehensive systems for the purpose of following up consumers' complaints in order to improve the serviceability of their products. Similarly, a great deal of educational or informative material has been prepared.

Retailers' Selling Aids—Unless the manufacturer lends practical assistance to his dealers the retail outlets may easily become a bottle-neck clogging the flow of merchandise from factory to consumer. The retailer looks to the manufacturer for selling aids and ideas, and cooperation at this point is profitable to both.

Prompt Delivery—A manufacturer whose plant is in Utica, N. Y., has devised a plan which permits orders received in New York City, one hundred fifty miles away, as late as four o'clock in the afternoon, to be filled in Utica and delivered to the customer the next morning. The order is typed as it is received in New York City and is instantly reproduced in Utica over a leased telegraph wire and is shipped out that night.

Mr. Madden concluded with a picture of the various types of collective action now coming into existence through the growth of inter-industry competition. In that connection he cited the joint advertising of trade associations to the consuming public and the organization of the New England Council which exists for the purpose of enabling business men of that section to interchange ideas on their problems relative to the economic progress of New England. Similarly there are now manufacturers of related, but non-competitive products, who conduct cooperative advertising.

Unfair Competition and Price Discrimination

EXECUTIVES present at the first session of the Policies Division also heard an elaborate analysis given by Harold Smith, general solicitor, Westinghouse Electric & Manufacturing Company, of unfair competition and price discrimination as affected by the recent American Can Company decision.

The following extracts from Mr. Smith's address serve to spotlight the important features of his discussion:

"The gist of the decision is embodied in the Supreme Court's holding, in response to certain questions certified to it from the Circuit Court of Appeals, that it is a violation of section 2 of the Clayton Act if (1) a seller of goods, engaged in a different line of commerce from purchasers engaged in the same line of commerce, discriminates in price between such purchasers, and (2) such discrimination substantially lessens competition or tends to create a monopoly in the line of commerce in which the purchasers are engaged.

"The foundation of the court's reasoning in reaching this conclusion is summed up in the following language:

> 'The fundamental policy of the legislation is that, in respect to persons engaged in the same line of interstate commerce, competition is desirable, and that whatever substantially lessens it or tends to create a monopoly in such commerce is an evil.'

"The American Can Company decision held section 2 of the Clayton Act to be clear, not subject to interpretation of committee reports, etc., and to apply to acts of a seller which might discriminate between purchasers from him engaged in the same line of commerce."

Modern Technique in Cost Accounting Will Yield Results

MR. SMITH continued with an analysis of the case of Mennen vs. Federal Trade Commission and National Biscuit Company vs. Federal Trade Commission. He pointed out that the Supreme Court in the American Can Company case had disagreed only with that portion of the decisions in the other two cases which held that section 2 of the Clayton Act had no application unless the seller and the purchaser were competitors of each other. He showed by analysis of the Mennen and National Biscuit Company decisions that in each instance there were other and independent grounds which fully sustained those decisions.

In conclusion Mr. Smith stated that "It is, therefore, apparent that nothing in the American Can Company case decision in any way restricts or affects—

> '(a) The right, as sustained in the Mennen case, of a seller to differentiate in price and discount between purchasers, even though in like quantities, where such purchasers fulfill different functions in the process of merchandising, and, therefore, are not really competitors, as between themselves; nor
>
> '(b) The right, as sustained in the National Biscuit Company case, of a seller, who has established prices and discounts which are the same for all purchasers in like quantities, to determine, in good faith, who are purchasers entitled to such a discount.'

"On the contrary, insofar as the American Can Company decision has any relevancy whatever, it sustains by implication the freedom of the seller to exercise his own discretion in respect of any of these acts."

The second session of the Policies Division was held on May 20 and was addressed by Thomas W. Howard, Chamber of Commerce of the United States, Edward T. Gushee, purchasing agent, Detroit Edison Company, and Alfred E. Waller, managing director of Nema.

Speaking on "Some Possibilities of Cost Accounting," Mr. Howard urged executives of the electrical manufacturing industry to continue their interest in uniform cost accounting. Quoting from an address which was made thirteen years ago by Edward N. Hurley of the Federal Trade Commission, Mr. Howard said: "When business was done on a large percentage of profit, questions of accurate cost and of operating efficiency were not so important, but in most lines of industry today the large percentage of profit has passed. Manufacturers are working on smaller margins and must absolutely know what their goods cost. Any unreliable method of arriving at cost of production with margins of profit so close must be eliminated. It is significant that this viewpoint was first expressed at the time of publication of the first edition of *Standard Accounting and Cost System for the Electrical Manufacturing Industry.*"

Mr. Howard went on to discuss some rather striking variations in range of manufacturing costs reported by manufacturers making an identical article. In that connection he said, "In looking into the matter it has been found that the diversity of methods of cost accounting are responsible in large part for these great variations.

Possibilities of Cost Accounting

"LET US not fool ourselves. Most of us do not yet know very much about our costs. We are, however, on the threshold of a new day in this matter of cost accounting. Modern technique in accounting properly applied will yield results which correctly used by the executive will give him control over his business such as he never had before."

Thomas W. Howard

Our records show that in the case of various groups with which we have been in contact, twenty per cent of the manufacturers reported that they did not have cost accounting systems which were tied in with their general accounts; sixty per cent did not go to the extent of providing separate rates of overhead for their different classes of operations. Among these manufacturers four different common methods of distributing overhead to products were found, and only one manufacturer in ten used the machine hour rate method in his overhead application, a method which is generally considered to be the most accurate and reliable in the metal working industry.

"These are but a few evidences of the under-development of cost accounting procedure," Mr. Howard continued, "and of the diversity of methods employed. Obviously the cost figures laid before the executives in any one of these lines of industry could not be on a comparable basis.

"So let us not fool ourselves. Most of us do not yet know very much about our costs. We are, however, I verily believe, on the threshold of the new day in the matter of cost accounting. For years we have been struggling with details of the cost accounting mechanism, and even now we are suffering from the amateurish attempts of executives who insist on using home-made methods. But we have arrived, in my judgment, at a time when modern technique in cost accounting properly applied will yield results which, correctly used by the executive, will give him the control over his business he has never had before. In other words, the executive can solve all of the economic problems of his business if he is armed with reliable cost facts."

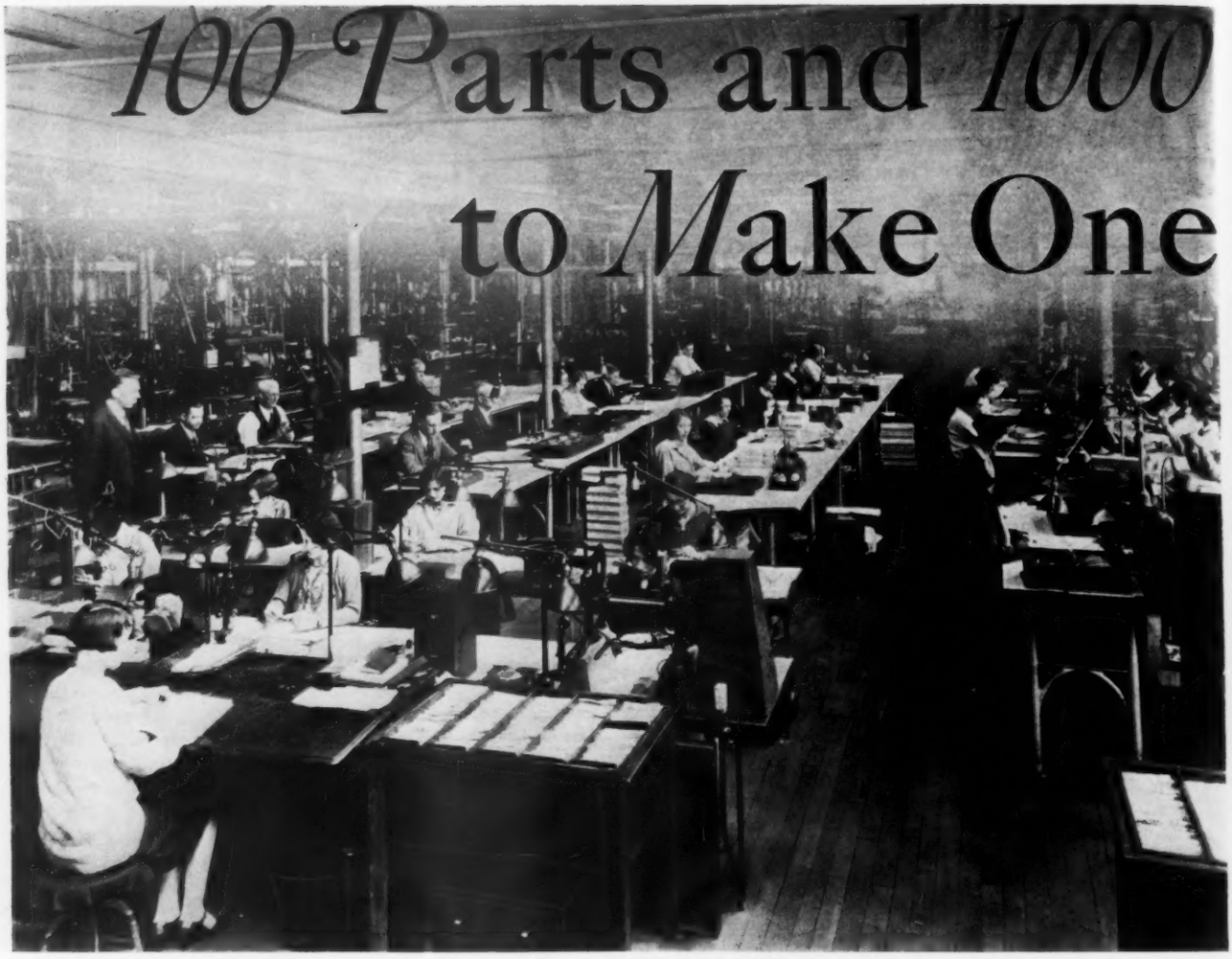
Purchasing Has Changed as Well as Marketing

AS in the case of marketing, the scene has also changed in the field of purchasing, according to Mr. Gushee, in an address to the representatives present on "Purchasing, Buying, or Bargaining."

"Purchasing today is generally recognized as a member of the family and an adult member at that," said Mr. Gushee. "Although not so many years ago the duties of the purchasing agent were chiefly stenographic. The distribution chart prepared by the United States Census Bureau will present one good reason for that change. In that chart it is seen that labor amounts to 17 cents of the manufacturer's dollar, manufacturing overhead, 25 cents,

(*Continued on page 65*)

100 Parts and 1000 to Make One



By Sidney Cassey

Publicity Manager, Weston Electrical Instrument Corporation

THE Weston Electrical Instrument Corporation is one of the pioneers in the construction of electrical measuring instruments, and numbers among its products almost every type of electrical measuring instrument employed in industry today. And, to insure that these will render a full measure of service they are all constructed with the utmost care and accuracy. How this is accomplished

PRIOR to 1886 Dr. Weston among his many activities was engaged in the manufacture of dynamo electric machines for electroplating and lighting purposes. His labors were greatly hampered by the lack of exact electrical measuring instruments. Those that were existent at that time were at best inaccurate, cumbersome and very slow in operation, requiring lengthy, time consuming calculations to determine results.

Dr. Weston laid aside his manufacturing and set out to develop electrical measuring instruments that would be exact and direct reading. His labors covered an almost endless series of experiments and investigations, to produce magnets that would remain permanent, alloys for resistance wire that would have a negligible temperature coefficient, instrument springs that would have the resilience of steel but with the conductivity of copper, shunts for use in current measurements and a host of other important items. Manufacturing processes of unheard precision had to be devised and highly special tool equipment constructed.

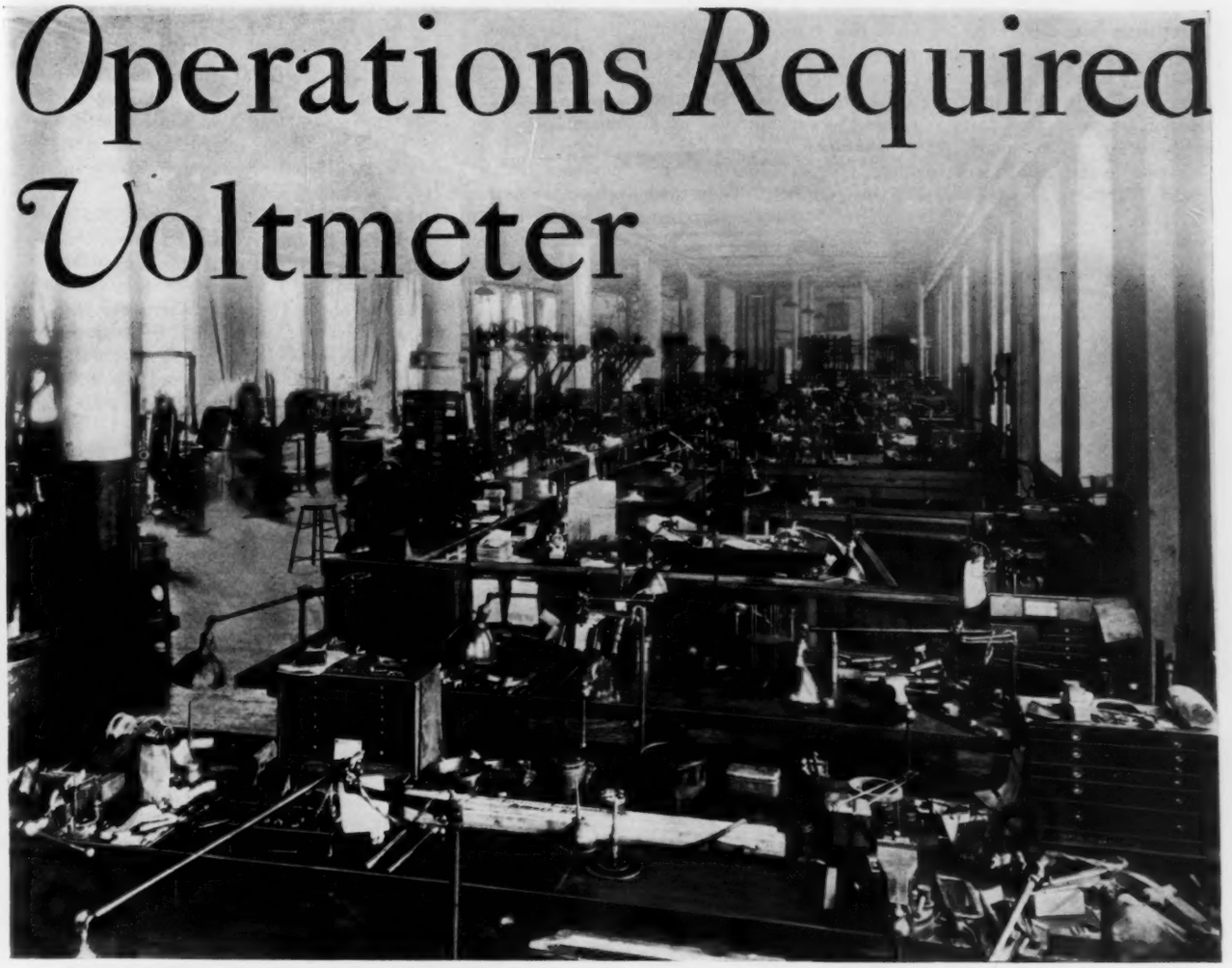
Dr. Weston's efforts were finally rewarded when in 1888 he brought out his first direct current instrument, known as Model 1. At first it was viewed with skepticism by the scientific world, but this soon gave way to its most enthusiastic reception.

The thoroughness with which Dr. Weston applied himself in blazing an absolutely uncharted field is well exemplified in the fact that after forty years of existence Model 1 is now basically the same as produced in 1888. It is still the prototype of a very worthwhile direct current instrument, and so Dr. Weston won an early reputation for his product which has been perpetuated down to the present time. This reputation has been steadfastly maintained because of the company's continued pioneering efforts and its basic motive never to market an instrument that is not worthy to bear its founder's name.

And so on down through the years with the ever expanding growth and use of electricity Weston has kept pace with the progress by developing new meters to meet each new requirement as it arose.

Today this corporation manufactures one of the most extensive lines of indicating electrical measuring instruments. It has rightfully won a world wide reputation for the accuracy, dependability and quality of its products.

Operations Required Voltmeter



SOME 50,000 parts enter into the construction of the full line of Weston Electrical Instrument Corporation products and more than 10,000 of these are manufactured within tolerances of one ten-thousandth of an inch. Such extreme accuracy requires the most minute inspection and precise production control. For this reason an extensive inspection department is required, which is shown in the view on the opposite page. Above is a view in the tool making department where some 30,000 accurate inspection gages and tools are manufactured

To be of real service to its user an electrical measuring instrument must be trustworthy, it must faithfully indicate at all times the true conditions existing in the electrical circuit to which it is connected, otherwise there is small excuse for its existence.

If an instrument is to render the proper character of service it must be of scientific and properly balanced design, the movable system must have a large ratio of torque to weight, it must be free from friction. The vital parts must be fashioned to very close tolerance to insure good scale characteristics and a long useful life of accurate dependable service.

The long years of instrument design and manufacture under a continuous, unbroken, unified control have given this corporation an unparalleled experience in the fabrication of extremely precise parts and in the assembly of finished instruments.

Some 50,000 parts enter into the construction of the complete line of Weston instruments, more than 10,000 of which are held within tolerances of one ten-thousandth of an inch.

To accomplish a program of such size and refinement a vast equipment of special and highly precise tools is required. These tools are designed and built in the Weston factory and some small idea can be gained by referring to the accompanying illustrations showing sections of the tool manufacturing and tool storage departments.

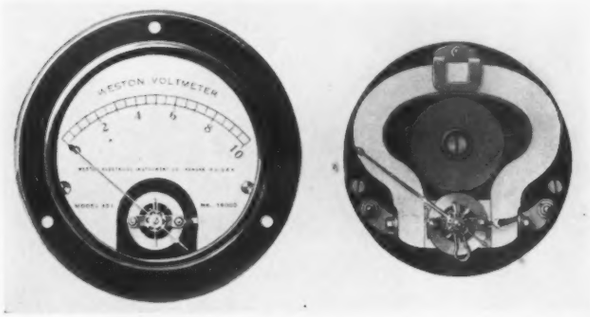
The finished tools, gages and fixtures of which there are more than 30,000 are stored in a fireproof vault. It is no ordinary tool crib, it holds a priceless treasure of equipment for fabricating the minute parts entering into the construction of Weston meters. The degree of refinement to which these parts are made is rarely found and perhaps nowhere else called for in the metal-working arts. As explained before, these close tolerances are not resorted to as a mere hobby—they are fundamental with good instrument design and are necessary where mass production methods are employed and instruments are required to render a high degree of continuous dependable service.

To insure accuracy of the proper order all the vital parts of Weston instruments are made in our own factory. By no other means could the grade of finished material be made to suit such exacting requirements. Many of the parts are made on automatic screw machines so

skillfully tooled and set up as to produce a finer grade of parts than is usually expected from this type of equipment.

This refinement of finished material makes interchangeability of parts possible, an all important factor in assembling quality instruments on a production basis. The production of these fine parts requires the constant use of a large battery of automatic screw machines.

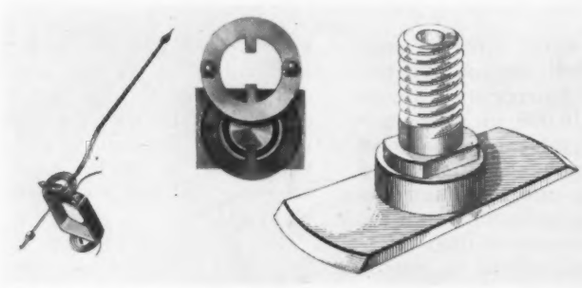
Frequent inspections are invaluable in safeguarding the quality of parts and the finished instruments. They also



Here are shown both the exterior appearance of a Weston Electrical Instrument Corporation Model 301 *voltmeter as well as the operating mechanism of the device, which is fully described*

insure against losses that would be incurred by further operations on parts that are not up to standard. In the general inspection department shown in one of the illustrations, thousands of microscopic examinations are made daily and no parts are adjudged fit for identification with Weston instruments that do not measure up to definitely prescribed standards.

The particular instrument selected for treatment in this article is one of several hundred models manufactured by this corporation. It is the well-known Model 301, which will be readily recognized from its illustration. This model is made as direct current voltmeters, ammeters and milliammeters and has innumerable applications in the radio and



Some of the delicate mechanisms of electrical measuring instruments are shown in the view above. At the extreme right is an enlarged view of one of the pivot bases of a Model 301

electrical industry for small panel uses. Companion instruments that match in size and appearance are also made in alternating current and thermo-couple types.

One of the illustrations shows a Model 301 completely assembled with the case and dial removed. It is a permanent magnet movable coil type instrument and its principle of operation may be briefly described as follows: A movable coil which is carried in jewel bearings rotates between the soft iron pole pieces of a permanent magnet and a soft iron core. The air gap through which the movable coil travels is materially restricted in size in order to maintain the permanency of the magnetic system. Current enters the movable coil through the back connection studs and the instrument springs attached to the staff of the movable coil causing the coil to rotate, thus carrying over the instrument scale the pointer which is rigidly attached to the movable system.

Spring torque opposes the electrical forces impressed on the meter and when these two forces are balanced the movable system comes to rest. Dead beat action of the pointer is effected in this type of an instrument by eddy currents which are generated in the aluminum frame on which the movable coil is wound.

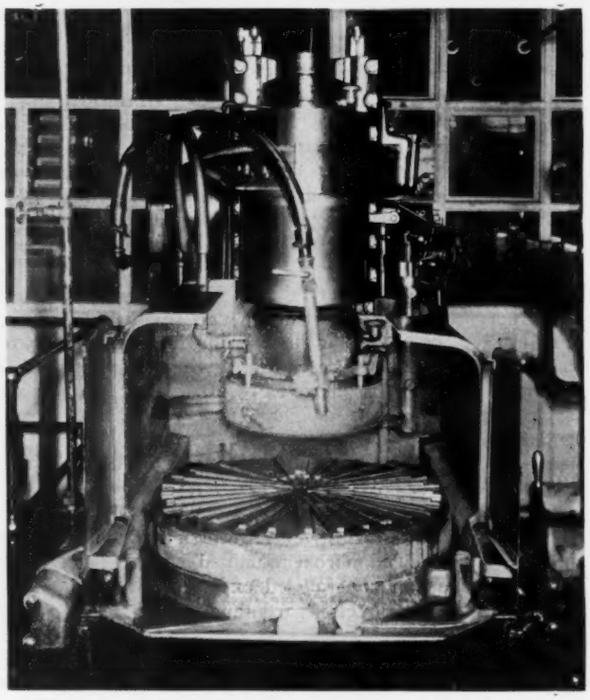
Despite its miniature size, only 3¼ in. in diameter, Model 301 has a guaranteed accuracy of 2 per cent. Moreover, this accuracy is permanently assured because of its careful design and skillful workmanship. A completed instrument contains 100 parts, requires about 1000 manufacturing and assembling operations and several hundred rigid inspections.

By referring again to the view of the instrument the complete movement can be seen clamped between the ends of the permanent magnet. It consists of the pole pieces, the core and the movable system.

The craftsmanship which is typical of Weston meters enters even into the construction of a popular low priced instrument such as the Model 301. A detailed description of the manufacturing processes involved in making the pole pieces and the pivot bases for this model will serve to show that precision manufacture is not confined solely to the most minute parts. The pole pieces are the largest part of the movement assembly whereas the pivot bases are among the smallest.

By reference to the illustration showing the construction of some of the parts of the instrument the pole piece and soft iron core assembly are shown, but with the top bond and bridge supports removed to show the recess into which the bond fits. The core is rigidly held in alignment by the small projections on the inside of the bond. The nicety with which these parts are made assures extreme precision in the form and width of the air gap through which the movable coil rotates.

The pole piece blanks from which a pair of pole pieces are made are rough formed in rectangular blocks and are inspected before any further work is performed. The



One of the machines used in the manufacture of Weston electrical measuring instruments. It is a grinder, fitted with a magnetic chuck for forming instrument pole pieces

blanks are then assembled in rows on the magnetic clutch of a grinding machine, and the bottoms ground level. The blanks are cleaned, reversed on the chuck and the tops are ground for thickness. By this same process the ends and sides are ground level and to dimensions—burrs are removed and after a thorough cleaning they are sent to the general inspection department. There they are checked for shape and size with Go and No Go gages which allow for tolerances of only ±.0005 of an inch.

The finished blanks are then routed to the automatic screw machine department where they are placed in a chuck of one of the machines and in six operations the bore is drilled, squared, reamed and a radius turned on the end of the bore—the bond seat or recess is rough turned then finished turned for diameter and depth. Burrs are removed and a center punch mark made in the recess as an identification mark when grinding the bore. The pole piece is then reversed and inserted in the chuck of a second automatic screw machine where in four operations the bond seat is rough turned and finished on the other side and the radius turned on the end of the bore. After being thoroughly cleaned they are again sent to the general inspection department. In checking these operations the tolerance allowed on the bore is ± .0005 of an inch and on the bond seat the allowance is from + .0001 to — .0003 of an inch.

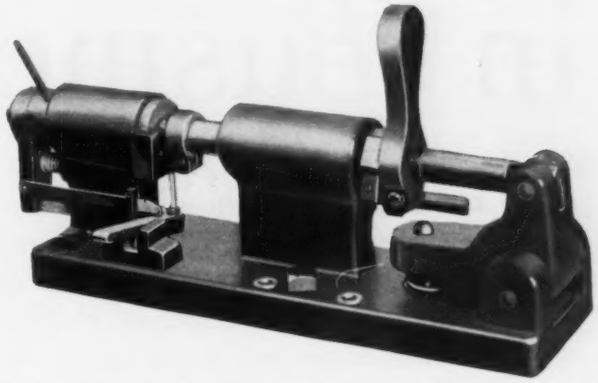
The next operation is performed in the drilling department where the four bridge support holes are drilled and reamed and two holes are drilled, countersunk and tapped for the magnet to pole piece screws. The pole pieces are then numbered on one side with two corresponding numbers and the work is routed to the inspection department again. Here the bridge support holes are gaged allowing a tolerance of only .0002 of an inch. The tapped holes are checked with an internal thread gage.

In the next step the pole piece is inserted in the chuck of a precision lathe using the center punch mark in the recess as an index and the bore is accurately ground and checked by the operator with a plug gage.

The pole pieces are now ready for sawing apart and through their corresponding identification numbers are kept together in pairs throughout all the remaining operations. The horns are then milled to proper height and the work is again carefully inspected.

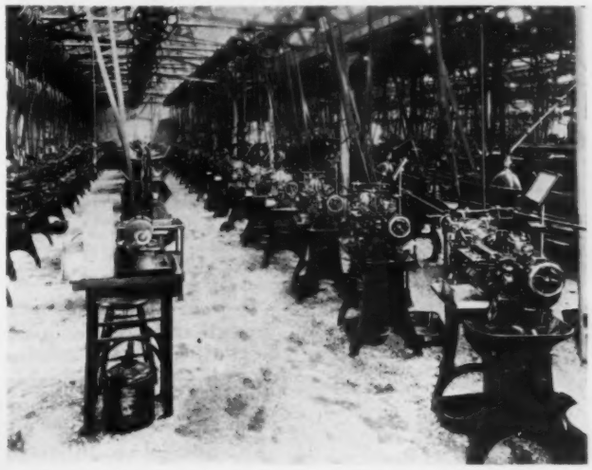
Supported in gang fixtures by the magnet screw holes the pole pieces receive a most thorough cleaning, are flash copper and nickel plated, sprayed with varnish and baked. After a general visual inspection they are ready for assembling. This assembly which consists of a pair of pole pieces, two bonds and four bridge supports is completed by two operations in a machine tool fixture, shown in the il-illustration below.

The pivot bases, two of which are required for each instrument, are cemented to the top and bottom of the movable coil. An enlarged view of the pivot base is shown in one of the illustrations with other parts of the instrument. They serve to carry the instrument springs and the pivots



This is an example of one of the many very accurate special tools employed in the making of electrical measuring instruments. It is used in one of the assembly operations

which support the movable system in its jewel bearings. The top base also forms a support for the instrument pointer. Although these bases are extremely small and of precise manufacture they are made complete on automatic screw



Screw machines constitute an important part of the machine tool equipment in the production of electrical measuring instruments, and the view above is but a small section of the machine department in the Weston plant

machines. Round brass stock is fed into the machines and the pivot base is finished complete in six short consecutive operations as follows: 1—Turned for thread and centered. 2—Flats milled. 3—Hole drilled. 4—Threaded, 200 threads per inch. 5—Pivot hole reamed, to a diameter of 0.0148 inch, a tolerance is allowed of only .0001 of an inch and 6—The finished piece is cut off. The bases are then thoroughly cleaned and the run of production is carefully checked in the general inspection department.

The skillful design and precise craftsmanship that enters into the construction of all Weston meters is the user's best guarantee of dependable, long instrument life. Instruments that are built down to a price will never in the long run meet this acid test of service.

This is but a very small section of the tool vault in the Weston Electrical Instrument Corporation plant. In it are stored, ready for use, some 30,000 very costly tools and dies

Human Relations in Business

The American Management Association is a great clearing house for executives in every field. Through its activities such as meetings, addresses, discussions, correspondence and publications, it offers an unparalleled service in the way of fostering better exchange of problems

C. S. CHING

President, The American Management Association, Director of Industrial and Public Relations, United States Rubber Company

THE American Management Association is an organization which fosters and facilitates among the leading executives in the business world a free exchange of views on management problems. It has no creed nor definitely formulated set of principles. It is an open forum for the discussion of management problems, encouraging by the form of its organization and the spirit of its work a free exchange of views—no matter how antagonistic—on all problems of management.

A fundamental interest of the Association is the problem of human relations in business. To this field it is committed by the clause in its charter which states that the object of the organization is:

"To advance the understanding of the principles, policies, and practices of modern management and administration and methods of creating and maintaining satisfactory human relations in commerce and industry."

In their origin and development the present Association and its predecessors have been guided by the belief that out of discussion and the application of scientific methods to these problems of human relationships will come an increasing wealth of knowledge that will prove invaluable alike to employer and employee. It is to the encouragement of such discussion and the accumulation and dissemination of such knowledge that the American Management Association is devoted.

THE American Management Association has been guided by the belief that out of discussion and the application of scientific methods to the problems of human relationship will come an increasing wealth of knowledge that will prove of inestimable value to employer and employee and it is to the accumulation and dissemination of such knowledge that the Association is devoted

The history of this Association begins with the organization at New York University in 1913 of the National Association of Corporation Schools. The members of this group, which represented at least thirty-five corporations, stated that their purpose was:

"To render available to corporations authoritative data on corporation school methods successful and unsuccessful."

Their object was:

"To aid corporations in the education of their employees, (1) by providing a forum for the interchange of ideas, and (2) by collecting data as to successful and unsuccessful plans in educating employees."

Thus it becomes evident that from the outset the organization stood for a democratic pooling of experience that members might profit by the successes as well as by the failures of one another.

Almost simultaneously with the organization of the corporation schools group came the formation at Boston of the Employment Managers' Association. This was followed within the next four years by the organization of a number of similar groups in such cities as Philadelphia, Chicago, New York, Buffalo, Newark, Cleveland, Rochester, Pittsburgh, and Bridgeport, and by a national employment managers' conference held at Minneapolis in connection with the annual convention of the National Society for the Promotion of Industrial Education in January, 1916.

The impetus of the World War, which developed employment management into a major factor in business, led to the organization of the National Association of Employment Managers at Rochester in 1918.

Within a short time after they had organized both the schools group and the employment management group they found that their interests were wider than they had at first realized. At the conventions of the National Association of Corporation Schools such topics as labor turnover, psychological tests, and job analysis were being discussed, while the National Association of Employment Managers' conventions found so much interest in human relations with employees, other than the employment relations, that by March, 1920, they had decided to change the name of their

organization to the Industrial Relations Association of America. Moreover, duplication in the topics discussed at meetings of the two organizations, overlapping of aim, and identity of personnel had become evident. These considerations coupled with financial difficulties in which both associations found themselves led in March, 1922, to the merging of the two into the National Personnel Association whose avowed aim was:

"To advance the understanding of the principles, policies, and methods of creating and maintaining satisfactory human relations within commerce and industry."

This growth of interest from training and employment to personnel management and finally to mangement is typical of the growth in organization of business as a whole which took place during the years immediately following the World War. Personnel and training activities in the old order of small and loosely organized industrial or commercial units developed without being accurately classified and fitted into their proper places in the organizations as a whole. But as the individual units became larger and the clear recognition of the functions of control, operation, and service—or administration, line, and staff—became general, the conviction grew to a certainty that responsibility for personal work rests with management.

As leaders of this newer and saner attitude toward human relations problems, the members of the National Personnel Association voted in February, 1923, to change the name of their organization to the American Management Association. At that time its board of directors issued a statement entitled "The Personnel Content of Management" in which they said:

PERSONAL work is an integral, inseparable part of management, interwoven into all the efforts and activities of the production, financial, sales departments and the office. It cannot be segregated as an isolated function and all efforts to bring about such a separation are foredoomed to ultimate failure

"The definition of Management, expressed in the vernacular, is that 'Management is the art of getting things done.' Now the responsibility for doing in business rests upon the line organization and its individuals are in the closest contact with persons, or the human agencies, of commerce and industry. Therefore, the line organizations must deal directly and at first hand with personnel work and cannot divest itself of its responsibility in this connection merely by employing a staff personnel man in an advisory capacity.

¶Personnel and training activities in the old order of the small and loosely organized industrial or commercial units developed without being accurately classified and fitted into their proper places in those organizations

"FROM this point of view, which is basically sound and is receiving more and more widespread acceptance, the personnel job includes the organization of the personnel in the broadest sense, as well as its selection and training, and the development and well-being of employees.

"Stated in other words, personnel work is an integral, inseparable part of management interwoven into all the efforts and activities of the production, financial, and sales departments and of the office. It cannot be segregated as an isolated function and all efforts to bring about such a separation are foredoomed to failure. There is ample experience to prove this sweeping statement."

In conclusion this statement says:

"In an effort to select a name which will adequately represent the modern viewpoint, which will emphasize the final responsibility of the line organization in the personnel job, which will recognize its interrelation with the whole management problem, which will appeal to the works manager, the sales manager, the financial manager, and the office manager, and which will make them feel at home, the Board of Directors has considered the subject very carefully and decided to adopt the name, 'American Management Association' with an explanation to the title, 'Devoted exclusively to the consideration of the human factor in commerce and industry.'"

¶The American Management Association has freed itself from all restrictions and has developed from an organization that primarily served the interests of staff men to one which serves the interests of line executives

THE subtitle was intended to indicate that the Association's activities were not to be concerned with the technical aspects of production in the engineering sense. However, within a year, "exclusively" in this subtitle was changed to "primarily," and in 1925 the complete elimination of the subtitle was decided upon.

Thus, the American Management Association has freed itself from all restrictions, has developed from an organization which primarily served the interests of staff men to one which serves the interests of the line executives who now constitute the great majority of its members, and has placed itself in a position to deal with the subject of management in its widest interpretation.

Since its organization upon these broader principles, the membership of the American Management Association has been increased by the merging of the National Association of Sales Managers (February, 1924) and the Kardex Institute (February, 1928) as well as by the addition of many independent new members. At present the roster shows a total of 4171 members—an increase of about 400 per cent over the membership of 1923 when the American Management Association emerged out of the sundry experiments of its predecessors.

Although the Association makes special provision for the extension of its advantages to students, public and college libraries, teachers, and association executives, fully two-thirds of the 4171 members are officials of some 500 of the most representative American companies to whom membership is assigned by the officials of these companies on the basis of a plan by which the organization becomes a "company member." By this arrangement the associated companies assure themselves of the benefits of membership for those line and staff officers of their organizations who may be depended upon to disseminate the benefits of affiliation with a group of active students of the science of management throughout their respective organizations. The other third are individual members who either maintain for themselves association with one of the several divisions of the Association's activities, or for whom such membership is maintained by a company which is not itself a member. The interests of this group of individual members are served under separate divisions for financial executives, marketing executives, office and production executives.

Mr. G. S. Ching, director of industrial and public relations, United States Rubber Company, and president of the American Management Association says:

"The test of any association's worth is the extent to which it makes a contribution to society.

"Our Association has filled the need in providing facilities for exchange of experience and research in the field of management."

The organization by which the activities referred to by Mr. Ching have been sponsored and carried out is headed by a board of directors of which the chairman is Mr.

Sam A. Lewisohn, vice-president and treasurer of the Miami Copper Company; the president, Mr. C. S. Ching, supervisor of industrial relations, United States Rubber Company; the treasurer, Mr. John C. Orcutt, vice-president, American Exchange Irving Trust Company.

¶ The responsibility for doing business rests with the line organization and its individuals are in closest contact with persons or the human agencies of commerce and industry and must deal with personnel work

WORKING with these officers are seven vice-presidents: Mr. Harry B. Gilmore, secretary, Western Electric Company, Inc., who is in charge of the Research Program and Publications; Mr. H. A. Fountain, general manager and treasurer, Hibbard Cabinets, Inc., who is in charge of the Financial Executives' Division; Mr. Henry W. Cook, vice-president, Northwestern National Life Insurance Company, in charge of the Office Executives' Division; Mr. Oscar Grothe, vice-president, White Sewing Machine Company, in charge of the Production Executives' Division; Mr. George R. Cain of the advertising department, Swift & Company, in charge of the Marketing Executives' Division; Mr. H. A. Hopf of H. A. Hopf & Company; Mr. C. R. Dooley manager, personnel and training, Standard Oil Company of New Jersey; the secretary and managing director who devotes all of his time to the work of the association at its offices, 20 Vesey Street, New York, N. Y.; and twenty-one additional members.

ONE outstanding and astonishing development in the world of business today is the new and surprising willingness of big business men to freely exchange ideas bearing upon the intimate methods and facts of their own concerns. Floundering along through experimental efforts is no longer necessary

Under the direction of this board come the twelve major activities through which the services of the association are chiefly rendered. These consist of:

A—A monthly magazine, *The Management Review*, which in addition to one or two timely articles publishes in each issue abstracts of management articles appearing in the previous month and authoritative signed book reviews of recent books on management.

As this publication is received by each member, the convenience of those whose interests are specialized and whose time is full is further served by classifying all abstracts under the captions: general management, financial management, marketing, office management, and production. It is the purpose of the *Review* to provide a convenient way for busy executives to survey in an hour and a half the best management literature appearing during the past month in over four-hundred publications.

B—A quarterly magazine, *Personnel*, in which appear articles on selecting, training, compensating, transferring, promoting, organizing, and pensioning employees.

This magazine, which particularly carries on the tradition of the personnel movement out of which the broadened management movement grew, is received by each member of the Association. It is the policy in this publication to cover personnel problems affecting office and factory workers, retail and field salesmen, junior executives, and even other executives.

C—Business Conditions and Forecasts, the third item in the service which the Association supplies to each of its members, is a monthly analysis of the statements and opinions of the representative leading authorities on business conditions and the business outlook.

In compiling this digest such statements as those issued by the American Exchange Irving Trust Company, Cleveland Trust Company, National Bank of Commerce, National City Bank, Alexander Hamilton Institute, Babson's Statistical Organization, Harvard Economic Service, etc., are reviewed. A tabular comparison of the opinions offered by these authorities is provided under such topics as present conditions, general forecast, financial conditions, stock market, commodity prices, distribution, labor and wages, agriculture, building, transportation, foreign trade, and conditions. The whole is thrown into so concise a form as to be convenient for posting or reference.

D—Two general conventions are held each year—mid-western in autumn and eastern in spring.

These meetings offer an opportunity for executives to meet others whose problems, similar or contrasting, are a stimulation to constructive thinking. By some members the conventions are looked upon as the most valuable of the activities in which the Association engages. In many companies definite steps are taken to determine just who should attend each conference or what parts of the conference. That attendance upon the conventions is considered valuable is indicated by the number of members who report care in their selection of representatives and definite provision for communication of reports by these representatives to other members of their organizations.

The topics discussed at the two annual conventions are chosen because they should be of interest to all types of executives. The discussions themselves are, as Mr. Lewisohn points out "presented by men actively engaged in business life." For example, at the Hotel Pennsylvania during May such subjects as: "Fashion, Style, and Art in Business," "Consolidations and Mergers," "Committees: Their Functions and Administration," "The Comptroller: His Functions and Relationships," "Style and Its Relation to Budgeting," "Price Fluctuations and Their Relation to Budgeting," "Pensions," "Age in Relation to Employment," "Office Planning Departments," and "Train-Office Supervisors" were discussed by such authorities as Mr. Irwin D. Wolf, secretary, Kaufmann Department Stores, Inc.; Dr. Willard L. Thorp, member of the staff, National Bureau of Economic Research, professor of economics, Amherst College; Mr. James O. McKinsey, James O. McKinsey and Company; Mr. J. P. Jordan, partner, Stevenson, Harrison & Jordan, management engineers; Mr. Willard E. Freeland, president, Freeland & Warren, Inc.; Mr. J. B. Deacon, assistant to the president, Tide Water Oil Company; Mr. T. G. Wharton, assistant general auditor, The Atlantic Refining Company; Mr. Louis F. Musil, director of finance, Henry L. Doherty & Company; Mr. C. R. Dooley, presonnel manager, Standard Oil Company of New Jersey; Mr. H. C. Pennucke, manager, planning and personnel, American Central Life Insurance Company; and Mr. Byron F. Field, superintendent, training division, Commonwealth Edison Company.

¶ The former practice of surrounding with utmost secrecy the methods, practices, statistics and other important business information is no longer considered necessary and a great mass of data are available today

IMMEDIATELY following the conventions at which these papers are presented and discussed, printed copies in a series of separate pamphlets are prepared. Each member receives a copy of such publications promptly after the close of the convention. This system permits the reading of papers of particular interest by several company associates of members at the same time.

E—Recognizing the need of continuous, organized discussion of methods in management and business research

(*Continued on page* 74)

A Woman Talks!

About Selling to the Housewife

Advertising intended to introduce labor saving devices into the home is misdirected if it appeals to the drudgery of housework or woman's martyrdom as a housekeeper

Phyllis Krafft Dunning

By PHYLLIS KRAFFT DUNNING
Home Service Director,
The Society for Electrical Development, Inc.

THE AUTHOR of this article, aside from her experience as Home Service Director of The Society for Electrical Development, Inc., is a graduate of Massachusetts Institute of Technology and has had considerable experience in advertising work. As she is a housewife herself she is fully qualified to tell what advertising should appeal to the woman in the home, what the appeal should be and how it should be directed.
THE EDITOR

IF YOU wanted to sell a business man an electric typewriter would you attempt to do it on the basis that if he installed one his secretary could do her work so much more quickly and efficiently that she could go home every day at three o'clock? If you were trying to sell the owner of a manufacturing plant some intricate and expensive new machinery, would you use as your argument the fact that with this new machinery the same quantity of work could be turned out in much less time so that he could close down his plant every afternoon an hour after lunch?

Not unless you're crazy you wouldn't. But that is exactly the sort of argument that electrical manufacturers are using in their efforts to get women to purchase electrical equipment to use in their homes.

"Buy a Hurryup Washer and you can go to the movies on washday afternoon" they chirrup. "Install a Getshot Electric Range and you can play golf every afternoon," they carol. "Own an Eatsdirt Vacuum Cleaner and you can go to tea parties every day," they warble. Or words to that effect. On every hand we hear the same sermon—escape from drudgery, get away from it all, flee the bars of your cage, have time to live—and so on and on and on.

And the exhortation falls in the footlights—why? Because the average woman doesn't consider her housework drudgery, has no consuming desire to get out of doing it, doesn't consider her home a cage, and furthermore hasn't anywhere special to go, anyway. That, messieurs, is what I have learned about the great American housewife—the result of five years of being one and many years of associating with them on very friendly terms.

If the ladies want to go anywhere special they will go, housework or no housework, and dinner will come from the delicatessen or be eaten in the nearest restaurant. (Have you discovered that you can get a very passable dinner in many a tea room for a modest dollar?)

Of course, I know whence came this idea that women are all beating their wings and pining away beneath their domestic burdens. They say they are, themselves. They shout it from the housetops. They greet their returning husbands at night with a detailed statement of how desperately tired they are, how utterly exhausted they are and give a complete account of the back-breaking tasks they have accomplished which have reduced them to this pitiable state of collapse. And the husband is convinced that the tasks are hard and goodness knows they look dull and stupid enough to the naked eye, so he thinks that housework must be an ogre and a demon to the poor little woman.

Thus women have built up a perfectly swell reputation for being martyrs and they love it. They even get to thinking that they actually are martyrs—but they love their martyrdom, make no mistake about that. They get more pleasure out of complaining about how hard they work than they would out of going to the best show in town.

To convince yourself that I know whereof I speak you have only to glance at the fiction with which the popular women's magazines are filled. There are stories wherein the restless wife, seeking escape from her seemingly irksome domestic bonds, runs off to achieve fame and wealth, only to discover once she has achieved them that she really prefers washing dishes in the little homestead after all. There are other stories wherein the heroine, torn between her desire for a career and her love for the hero, capitulates to his honorable proposals at once (and that constitutes a short story), or holds out and pursues her career only

to find it is as dust and ashes, whence she returns to her true love and admits her error in spurning marriage (and that makes a long, continued story). Then there is the good old theme about the couple who have risen from poverty, attained riches and lost the happiness of their youth. This happiness is subsequently recaptured when the husband loses his money and they return to their former lowly state and she has once again to do her own laundry. Women love this stuff. They believe it. Why? Because they feel that way themselves—that it is woman's lot to work with her hands for her family and that any woman who tries to avoid it is riding for a fall.

¶ The big difficulty to be overcome in the struggle to instill in the female bosom a desire for labor saving devices is a matter of uprooting a lot of inherited instincts

IF YOU can bear to look at the situation with unbiased eyes, unemotionally, coolly and as from afar, this is what you will discover. That women are essentially and fundamentally homemakers and never thoroughly happy in any other job. That they basically enjoy performing their homemaking tasks. That their all-consuming interests are in their homes, their husbands and their children. And that they are concerned with the care of those homes, husbands and children in the best of all possible ways and at any cost to themselves.

There are those who will rise up and point to this woman or that who is careless about her home, indifferent about her children and none too enthusiastic about her husband. I know some of these women, too. And I know that they make up as poor a market for household equipment as you would find in a year's journey. They are not interested in doing their jobs better. They are not interested in doing them at all. And you might as well forget about them unless you want to go in for character reforming as part of your sales plan.

BEFORE we can get women to demand domestic electric equipment we have, obviously enough, got to make them want it. And to make them want it we have the neat little task of overcoming their passion for playing the martyr. There are many pleasant leisure hours for the housewife who uses labor-saving appliances

The big difficulty to be overcome in the struggle to instill in the female bosom a desire for labor saving devices is a matter of uprooting a lot of inherited instincts.

Certain methods of looking after husbands and homes and children have been ingrained in feminine heads and hearts and hands by generations of hard working ancestresses. Female labor has always been cheap. A man could get as many wives as he wanted, and except under a few regimes, get them entirely free. When one wore out and died another could be easily obtained. The graveyards of our pioneer forebears are mute testimony to the truth of that fact.

This *modus operandi* has, within the boundaries of civilization, recently suffered some severe set backs, although the dear old system still prevails wherever even a remotely primitive condition exists. But hot and cold running water, modern plumbing, gas and electric lights and central heating have elevated women from the slave state. Just these few modern improvements have relieved the housewife of so much labor that she can look back at her wood-toting, water-carrying, lamp-cleaning, half-frozen ancestress and laugh merrily.

She should kick about washing dishes or clothes when she can get plenty of nice hot water just by turning a faucet! She should argue for an electric refrigerator when she can have an ice box right in the house, without even having to go down cellar, let alone out to the spring-house, to find a cold place to store things! She should demand an ironing machine when her little electric hand iron is at least eight times better than the old sad iron she remembers from her childhood! Don't be silly! She has things pretty easy as it is!

Before we can get women to demand domestic electric equipment, we obviously enough have to make them want it. And to make them want it we have the neat little task of overcoming their passion for playing the martyr, and battering down their age-old notion that the work of their hands and bodies is worth nothing. Men have for so long been using their brains to save their muscles that they cannot see why women fail to grasp the idea at once. The reason is that men have taught them not to.

¶ Fundamentally the problem of introducing labor saving appliances into the home resolves itself into that of overcoming the martyr complex which afflicts most women

WE MUST teach women self-appreciation. Not the whining, sniveling appreciation she showers upon herself when she accomplishes some ox-like task which no man in his senses would do twice without endeavoring to find some way around doing it, but the appreciation that says, "I am too valuable to do this sort of work. A machine can do it better and quicker than I can. I am a witless fool to wear myself out in its accomplishment." And that, dear reader, is no easy stunt. You have habit, tradition and instinct arraigned against you.

In attacking this problem you must realize that you have two distinct groups of homemakers—the young ones and the older ones.

The older woman has presumably been keeping house for a goodly number of years, and doing, in her opinion at least, a very good job of it. She has her own systems and methods and they work. She has, in most cases, become so hardened to the routine of housework that it would be an actual wrench to change it. She has been doing her tasks for so long that she has no very positive feelings about them. She may be likened to the prisoner who grew so attached to his chains that he couldn't bear the thought of parting from them.

The younger housewife presents a far easier problem. She will probably be better educated than the older woman. She may have been in business before her marriage. She is apt to find the routine of housekeeping a bit monotonous, and as she will not have had time to form any very deep habit ruts she will be far more susceptible to arguments for better ways of doing her job. But she is young and strong and (we hope) in love with her husband and her home, and ambitious to save money and get ahead. In evaluating her strength against the purchase of a machine she is apt to see the machine as just so much less money in the bank and herself as a slacker for even considering its desirability.

How, then, are we going to convince these women that they are being very short sighted and foolish in foregoing domestic electric machinery?

First of all we must determine what their true interests are. Not the interests which speakers and writers and propagandists say they are concerned with, or ought to be concerned with, but the ones they actually are concerned with.

Probably the primary interest of every housewife is health. Not her own health, though. Through the ages women have been working themselves into early graves that their husbands and children might exist in health and comfort, and primarily their instincts remain the same. It is this utter disregard for self which so many women manifest that causes the logically sound argument about saving themselves via washers and ironers *et al.* to fall so flat. They don't consider the net value of saving their strength commensurate with that of saving the cost of the machine.

To make a health argument carry weight you must drag in the whole family. Sterilized dishes, washed in water far hotter than human hands can bear, constitute a better argument for a dish washer than the "keep your hands out of the dishpan, dishwashing is a loathsome and dull business" line.

¶ Women are essentially and fundamentally homemakers and they are never thoroughly happy in any other job. Their all-consuming interests are in their families

THEN, all women are interested in love—want to be loved. But dear, dear! the methods by which they go about inspiring love, once they are married! Why they should think that by complaining they will incite love I cannot understand, but they do think so. They have an idea that by telling their husbands how hard they have labored they will fire them with all sorts of noble emotions, that by proclaiming their utter exhaustion they will move them to heights of passionate tenderness. The system doesn't work, but they never cease hoping it will. And after everlastingly repeated efforts to arouse the desired response by the same absurd tactics, they complain bitterly that their husbands don't appreciate them. Why won't they learn that man values a lovely picture above a washboard, even though the picture is utterly useless!

Oh, there are so many ways of getting at the darlings. You can supplement the health and love appeals with appeals to their pride, their envy, their thrift, their sense of good housekeeping. But fundamentally it resolves itself into the proposition of overcoming the martyr complex and making them understand that a woman is worth infinitely more as a woman than as a truck horse.

We must make it fashionable to consider housekeeping an easy and pleasant business. One of the major sources of conversation at any women's gathering today is how tired they are, how hard they work and how unappreciated they are. We must make it smart to tell how simple and delightful housework can be, how well and strong they feel, and how much they are loved.

We must make them realize that it is better for both husband and children to have a refreshed and sympathetic and lovable woman in the house, rather than an exhausted and uninteresting automaton.

We must show them how, as individual human beings, they can bring more loveliness and comfort and inspiration to their families by keeping themselves young and lovely and companionable than they can by washing clothes and cleaning floors.

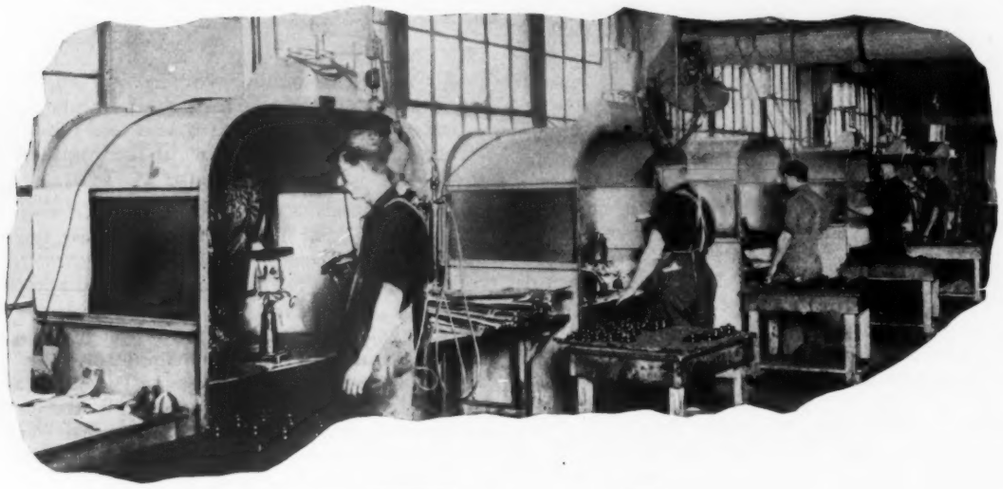
¶ We must teach women self-appreciation and that the work of their hands and bodies is worth something. And that labor saving appliances are essential in the modern home

WE MUST make them feel that their time is worth an infinite amount in preserving happiness, the health and contentment of the home, and convince them they cannot do this if they are worn out and tired and nervous.

Might it not be a good idea to approach the housewife with the same line of reasoning you would use in approaching the business man or the manufacturer when desiring to sell him electrical equipment? The same appeal will awaken answering echoes in the heart of the homemaker—that is, that through the use of electrical equipment she can do a better housekeeping job and can get the time to do the many household tasks, to attend to the finer details of perfect homemaking, which she would like to. Closets to be repainted and the shelves covered with gay papers, new draperies to be made, a new recipe to be tried out, a lamp shade to be fashioned, guest towels to be embroidered—there are so many things that they "hope to get the time to do someday!" Electrical equipment will give them the time and the energy to do these things—to make themselves better homemakers as well as more attractive wives and mothers. Go on and tell them about it!

TOO TIRED to enjoy her leisure hours is the lot of the housewife who fails to take advantage of the many labor-saving devices that are now available for the home. Compare this scene with that on the opposite page

Spray Finishing Fundamentals



By
PAUL W. COLLINS

AMERICA'S production methods have placed her merchandise on the shelves of the world's markets. Standardization has permitted unprecedented quality for the world's dollar. The finishing touch will give American products even greater leadership in this market. We have all seen inferior merchandise meticulously finished and polished greatly outsell merchandise of superior fundamental quality but which is lacking in the appeal of the finishing touch. Such object lessons are sufficient to the wary.

More and more consideration is being given to this phase of merchandising—the finish. Artists are consulted on relative psychological results of various color combinations. Finishing experts are sought regarding the application of suitable finishing materials. Paint and lacquer manufacturers keep research departments busy to meet the ever changing finishing requirements of manufactured products.

There is another angle to the finishing problem. Manufacturers are recognizing it more and more. The manufacturer's responsibility does not cease when the merchandise leaves the factory. Anything with a scratched or marred finish is indisputably harder to sell than if the finish were perfect or the color attractive to the customer. To meet these ends the pieces are carefully packed at the factory for shipment and a wide range of colors is the vogue for merchandise offered the public today. But finishes are still damaged.

SINCE there are so many things to take into consideration in the finishing of electrical products this, the first of a series of articles on the subject of painting and finishing, treats essentially with methods and equipment used in spray painting. Primarily, it discusses the several types or kinds of surface finishes, materials available and how they should be applied, with a thorough explanation of the various types of spray guns and their uses.
THE EDITOR

Customers want their refrigerator and furniture to harmonize. The service department is constantly getting trade-ins or trial-offer merchandise for reconditioning. The answer to these problems is a small refinishing unit in each distributor's or dealer's service shop and the cost of it is surprisingly small.

There are, roughly, three methods of applying finishes to a product.

Hand Paint Brush—This is a method that has been in use for so long that no explanation is necessary.

Dipping Process—In this method, the article to be coated is usually suspended by means of a hook. After having been submerged into the coating material and allowed to drain, it is hung at such an angle that all surplus material will run off freely and leave no pockets or streaks or runs. Special materials are used to meet individual requirements in the dipping process. They must,

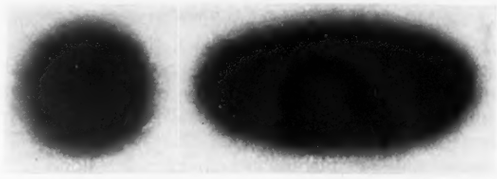


Figure 1 *Figure* 2

The surface to be sprayed is a good indicator of the type of spray gun to be used. For small objects the cone or round spray is the better as is shown in Figure 1, *while for panels or broad surfaces, the fan type spray as seen in Figure* 2 *is the better for use*

is a new type of lacquer appearing on the market much heavier in body and made up especially for production shops. It requires a higher air pressure and greater air volume in application. It should not be thinned so much as ordinary lacquers. Lacquers will not skin over. The drying process for lacquers is very quick since it is due to the evaporation of the solvent. For this reason, lacquers dry from the bottom outward instead of from the top of the coat inward, by slow oxidization as is the case with oil base materials. Lacquers usually set within three

Figure 6

HERE is another type of what is commonly termed the needle control spray gun. It is used primarily for applying small designs such as those on glassware or in coloring flowers and applying polychrome finishes

minutes and may be handled in half an hour. Lacquer solvents have very penetrative powers and will curdle oil base materials if the two are mixed together. For this reason one should take care that if a lacquer is being applied over an oil-base undercoat, the undercoat must be thoroughly dry and the lacquer coats should be misted on; that is to say, light coats should be applied.

Brushing Lacquers and Lacquer Enamels—Brushing lacquers were introduced on the market to be applied with a paint brush by the home owner and small user. The only trouble with this is that the application of brushing lacquers with a brush requires different handling than does the brushing on of ordinary paints and enamels and the public does not seem to grasp the knack. Brushing lacquers lend themselves very well to spraying, however, and are ideal for patching work, since they will not react so readily to a bit of grease or dirt on the surface which is being retouched. These materials have most of the commendable attributes of the standard lacquers except that they are a bit slower in drying. The solvents are less severe on oil base undercoats and the material dries with a natural luster much more pronounced than the luster secured from the regular lacquers. The particular objection to brushing lacquers is that they do not withstand the elements so well as the regular lacquers. They

Figure 7

HERE are shown four different spray patterns made by defective fan type spray guns. Compare these with the more perfect patterns shown in Figure 2. Irregularity in a spray pattern is due either to dirt of some form wedged in the spray gun orifice or the air orifices and the fluid tips are not in concentric alignment. For this reason care must be exercised to keep the nozzles clean and in their proper relation with each other

are generally conceded, however, to last about as well on indoor work. They are more heavily pigmented. The cotton content is greater. They have a greater covering factor. These materials generally set within ten minutes and the pieces are ready for handling at the end of approximately two hours. Commercially (that is to say in industrial terms) brushing lacquers are known more generally as retarded lacquers, signifying that the lacquer is slower in drying.

There is a new four-hour drying enamel recently placed on the market. This is the oil base material's answer to the brushing lacquer's claims for speed. This material usually sets within twenty minutes and is dry for handling in four hours; but in packing for shipment or rough handling it is preferable to allow it to stand over night. These materials rarely need thinning for spraying purposes

Figure 8

A NEEDLE control fan type spray gun with a suction cup attached. These cups are used when intermittent spraying is being done. If fluid is fed to the gun by pressure feed or gravity flow, the cup is detached and a fluid cup is attached instead

and may be applied at pressures ranging between 20 and 40 lb.

These two materials, brushing lacquer and four-hour enamel are rarely used in large production shops. They lend themselves very well, however, to the smaller shops and service stations.

Baking Enamels.—There are a large number of baked finishes and as many different materials to make them. Materials that are baked are either dipped or sprayed on. The pieces are suspended from conveyor channels and are pushed into ovens where they remain for periods of time ranging from twenty minutes to two hours, depending on the material. Space does not permit discussion of this type of enamels and their solvents, as there are so many of them. Many beautiful finishes may be baked on such as Crystal, Crinkle, Crackle, Porcelains, etc. Baked finishes require considerable investment in ovens and other equipment for handling after the material has been sprayed on. This naturally precludes their use in small shops.

The Spray Gun—When one is buying a paint brush he selects a brush of a given width, thickness, and style to meet the particular requirements of the work to be done. If it is a small surface, a small brush will best serve the purpose. If it is a large surface, or yardage and the time element involved is considerable, a large brush of a type in accordance with the material to be applied is selected. If the surface to be coated is irregular in shape such as machinery, castings, and the like, one style of brush is selected. If the pieces are small or the work is of a decorative nature, another style of brush is chosen.

In buying a spray gun, the same thoughts should be kept in mind. The size of the paint brush is gaged by its width in inches. The size or capacity of the spray gun is gaged by the number of cubic feet of air it consumes per minute; the greater the air consumption, the greater the capacity or speed of the spray gun. There are inexpensive spray guns for rough work as there are low priced bristle brushes. There are quality spray guns for use on work requiring a highly atomized coating just as there are expensive brushes of selected hair for the

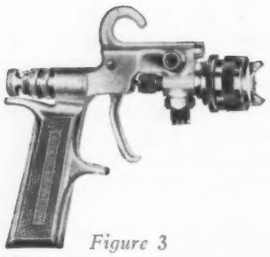


Figure 3

THIS is a spray gun known as the needle control design, in which the spray pattern is better controlled and more variable than that obtained with the simple type of spray gun shown in Figure 5

naturally, be sufficiently slow-drying to permit proper draining before the finish sets.

Spray Finishing—This is the latest and most popular method of finishing merchandise today. It has superseded the hand brush because it is many times faster. It has taken the place of dipped finishes in many instances because of being more economical. It likewise makes possible quick finishes and effects that ordinarily required many days. "Blending," "toning," "sheening" are all made easy and fast work. The use of lacquers and similar quick-drying materials is made possible with the spray gun. It is this last method of finishing that is of primary interest.

In spray painting, the essential requirements are: the spray gun, the fluid container, the compressed air supply, air filtration, air pressure regulation, proper ventilation, adequate light and handling devices (means for handling the merchandise while being sprayed).

These are all necessary points to consider. Their uses and function are all as fundamentally simple as learning to walk. Spray finishing is no more difficult to learn than brush finishing. The same materials may be sprayed with a gun as are applied with a paint brush. The job is faster and generally more satisfactory. The spray gun has permitted the use of quick-drying materials heretofore impossible to apply. These new materials (lacquers, lacquer enamels, etc.) enable faster production and preclude the necessity of so much floor space in the finishing room.

Spray painting is the same whether it is done at odd times in a shed or shops and factories. The essentials mentioned previously are considered in each case. For the sake of clarity and simplicity, production equipment will be considered first and then a complete detail of the small spray shop will be given. Between the two extremes one can easily take from or elaborate on equipment suggested to meet the individual requirements.

Before discussing spray equipment it might be best to mention briefly the materials generally used. Production shops using hundreds of gallons of materials in the course of a year usually have the material manufacturer supply this material to them in the viscosity or weight needed. Smaller shops buy standard packaged materials and thin or reduce them with the proper solvents to meet their individual spraying requirements. These requirements are generally termed spraying consistency, which is, briefly, the degree of liquid state at which the material being sprayed can be best atomized thoroughly and applied with a given air volume and pressure.

If the material manufacturer does not state the solvent to use for his product, the following table will be of safe reference:

Figure 5

THIS is the simple type of spray gun. The air passing over the fluid tip (vertical tube) creates a vacuum which draws the material out of the glass jar. The same air pressure then catches the material at the tip, breaks it up and applies it to the surface to be coated. This type of spray gun is commonly employed on small work and is ordinarily used for intermittent spraying on rough surfaces. As may be seen, it is simple in construction, and for this reason is easily maintained and operated

Cheap Paints—Turps (imitation turpentine).

Good Grade Paints—Turpentine (a little bit goes a long way).

Varnish Base Paints—Universal thinner (turpentine frequently kills the gloss).

Lead and Oil Paints—A mixture of turpentine and oil.

Shellacs—Alcohol.

Lacquers and Lacquer Enamels—Lacquer thinner of a good grade.

Calcimines or Water Paints—Water.

Paints—Ready mixed paints generally may be sprayed at the consistency as supplied by the manufacturer. There are, however, some paints of heavy pigment which must be either reduced in body or fed to the gun under gravity or fluid pressure, using an atomizing air pressure higher than the average, the average pressure being 40 lb. per square inch.

Shellacs and Varnishes—If of light weight, they should be sprayed at pressures ranging between 15 to 30 lb. Medium weight materials may be sprayed at about 40 lb. pressure. If very heavy, reduce to spraying consistency.

Lacquers and Lacquer Enamels—Material manufacturers have not attained standardization in the weights of their lacquers. Even different colors from the same manufacturer vary in weight or viscosity. Lacquers are usually reduced with the solvent suggested or supplied by the manufacturer, in the ratio of two parts solvent

(*Continued on page* 70)

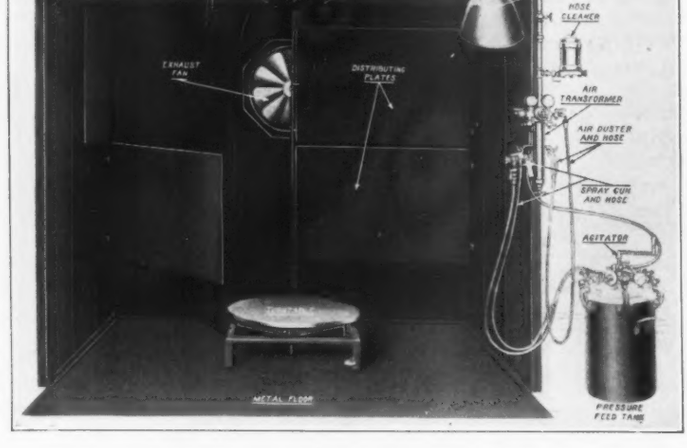


Figure 4

THIS is typical of the modern spray booth in common use today. It is adequately fitted with the proper light, so essential in painting, and with ventilators and the necessary baffle doors, which are shown as being open. The latter are used to insure proper distribution of ventilation. On the floor of the booth is a turntable upon which the work is mounted

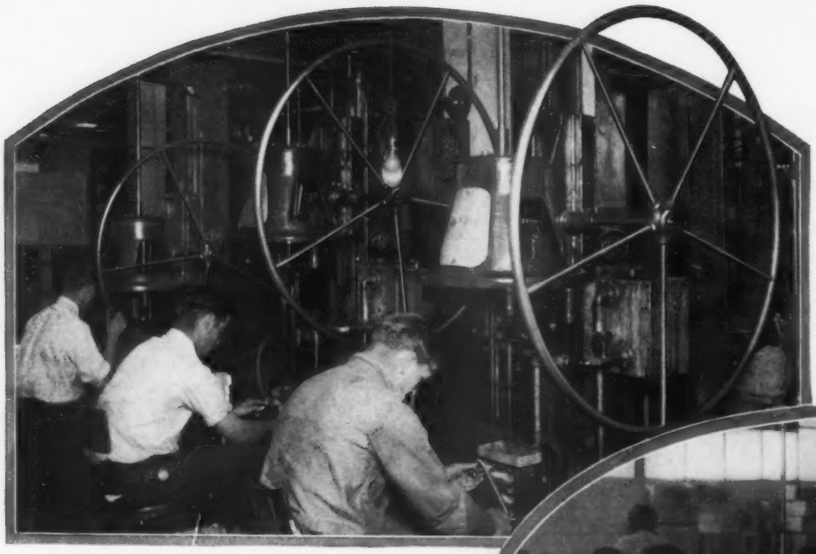
Radio Manufacturing Methods

ALL radio receiving apparatus sold by the Kolster Radio Corporation is manufactured in factories located in Newark, N. J. These are adequately fitted with the most modern equipment, arranged for mass production, and ELECTRICAL MANUFACTURING *acknowledges the cooperation of the Kolster Radio Corporation for the use of these illustrations showing their production centers*

THE view at the top of this page shows but a small section of the Kolster rectifier and transformer departments, where coils are assembled in the laminations. As will be noticed, this as well as the other departments are all arranged for mass production

THE production of radio parts requires the use of a great number of the most accurate tools and gages. In the Kolster plant these are made in the department shown in the illustration above

THE view in the center of this page shows but a few of a battery of high speed, automatic punch presses that are employed in the making of laminations for transformers. Immediately above are some of the machines used for braiding the covering for the cables used in speaker cords and the like. At the left is a large power press. Each of these machines is equipped with a counter that registers every stroke of the press. These counters record the daily output of the machines

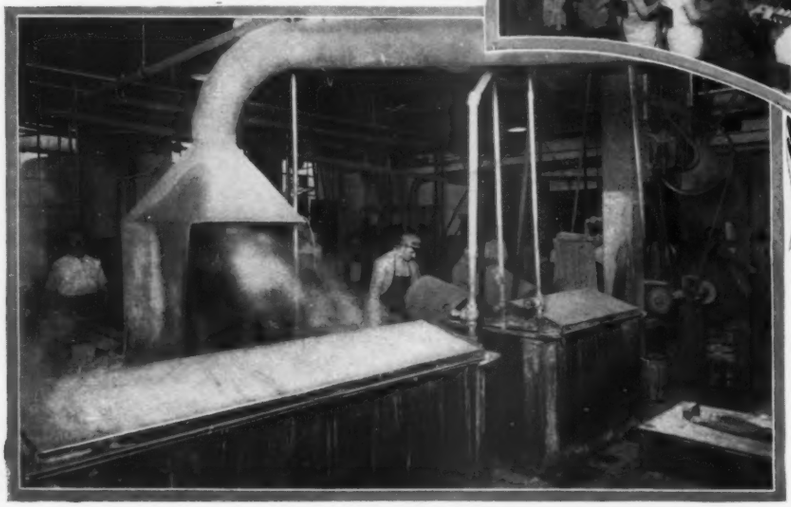


TO SIMPLIFY production, longitudinal gang condenser frames are drilled on these multiple spindle drilling machines shown at the left. The large handwheels are used for raising and lowering the drill heads. The women operators in the view immediately below are inspecting block condenser for capacity, leakage and the like. Each of these inspectors is carefully instructed in all the essentials of the work they are to perform, and to insure that they maintain Kolster's rigid standards of performance, individual records are kept in the form of charts, to show just what has been done during the day. These charts serve as a check on both output and performance

BATTERIES of machines such as those shown in the view below are used in Kolster plants to wind coils for loud speakers. These are very similar to the ordinary winding machines and are motor driven with foot pedal control

IT WILL be noted from the illustrations on these pages that Kolster has planned carefully for progressive methods of mass production in the manufacturing of its radio receiving apparatus

MANY radio parts require plating and polishing, and all such work in the Kolster plants is performed in the department shown below. Some small revolving plating tubs may be seen in the background



IN THE view above may be seen one of the large Kolster production centers. It is here that the final and complete assembly of the radio receiver takes place. Every operation is arranged in its logical sequence, and all the materials and parts are handled in accordance with scientific production methods. In this view gang condensers are passing along the assembly lines on conveyors

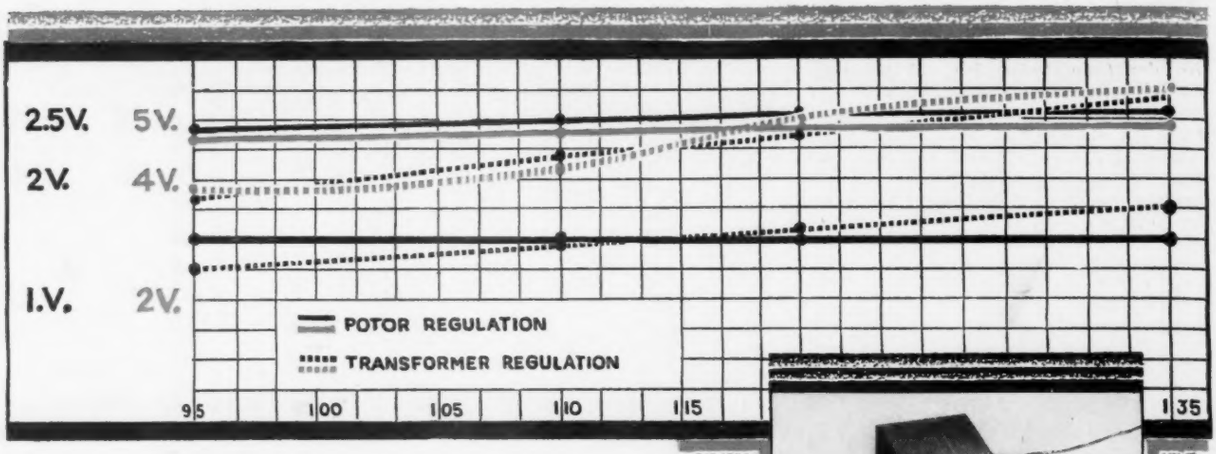
RADIO receiving apparatus manufactured by the Kolster Radio Corporation is developed and designed by the Brandes Laboratories, Inc., of Newark, N. J., based upon the fundamental research work performed in Dr. Kolster's laboratories in Palo Alto, Cal., and upon information gathered by field engineers in cooperation with the sales department and the experience of the engineering and manufacturing departments. The view at the right shows a drafting room in which electrical and mechanical designs are reduced to simplified manufacturing drawings

ALL Kolster products are carefully packed in corrugated containers before shipping. These containers pass from the final assembly sections of the plant through automatic package sealing machines and then on to the shipping departments, entirely on conveyors, as shown below

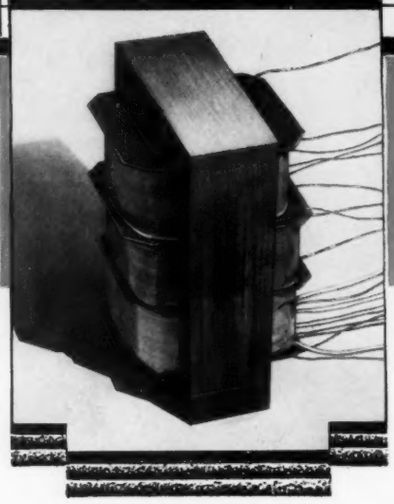
ABOVE is a view of a section in the gang condenser final assembly department. Here again it will be observed that manufacturing centers are carefully planned for quantity production

THE view below shows a section of the service department where all Kolster products are serviced at the factory. The work carried on here is primarily that of reconditioning and repairing receivers and speakers

POWER presses play an important part in the production of radio apparatus, as there are many parts that are made from stampings. Here, in the view above, is a section of one of the power press departments in one of the Kolster plants



POTOR
A NEW A·C VOLTAGE REGULATOR



POTOR replaces the transformer in a radio receiver. Illustrated is a typical model.

POTOR (Ward Leonard AC Voltage Regulator) replaces, for the manufacturer, the power transformer in any radio receiver. It is made of wire, insulation, and steel—the same components used in transformer construction. POTOR is entirely magnetic in operation. There are, of course, no condensers, resistors, moving parts, or thermally operated units used in, or in connection with, its design.

Any desired degree of regulation may be obtained (manufacturing costs are higher for very close regulation), and POTOR may be designed for any primary voltage range, frequency, and to provide the necessary secondary voltages.

Once the design data has been established, POTOR may be placed in production with no more difficulty than is associated with the manufacture of transformers.

Information on POTOR (Ward Leonard AC Voltage Regulator) will be sent upon request to the Chief Engineers and other executives of radio companies. If you have a specific regulator problem demanding immediate solution, please send us complete data, or preferably, plan to visit our plant yourself. We will show you POTOR in many applications, and discuss the manufacturing arrangements.

POTOR
WARD LEONARD
A·C·W
VOLTAGE REGULATORS

WARD LEONARD ELECTRIC CO.
MOUNT VERNON, N.Y.

Heavy Industrial Motor Repairing

Practically all of the motor repair work in the shop of George M. Jones, in Scranton, Pa., is very heavy and for this reason some of the equipment in this shop is larger than that in many motor repair shops throughout the country

By WILLIAM W. BAXTER
Associate Editor,
ELECTRICAL MANUFACTURING

IN the anthracite mining regions near Scranton, Pa., there is a great deal of heavy duty electrical apparatus in use, both in the mines and in manufacturing establishments of various kinds. This electrical equipment consists of motors, generating apparatus, transformers, control apparatus and electrically operated mine locomotives, hoists and the like.

To maintain and recondition such equipment requires the use of the larger and heavier types of machines and tools, such as are not ordinarily found in motor repair shops. However, the shop of George M. Jones, located at 916 North Washington Avenue, in Scranton, is adequately fitted with such equipment. Likewise there is ample apparatus available, in the way of hoists and traveling cranes, to permit of handling this heavy electrical equipment.

George M. Jones motor repair shop occupies two floors of a large frame building. Near the front of the shop, and on the first floor, is the welding department. Acetylene gas is generated in the shop and is piped to convenient stations throughout the building. All the work in the welding section is not confined to electrical equipment entirely, as a large part of the work in this shop consists of making repairs to most any device of a mechanical nature. Many heavy castings are welded here and much of the work is that of welding mining locomotive frames.

Directly in the rear of the welding section is the machine shop. In it are heavy duty drills, lathes, planers and a large capacity hydraulic press. Traveling the full length of the shop, so that it serves both the machine and the welding section, is an overhead crane, fitted with hand-operated chain hoists.

Along one wall of the machine department is a bench that is equipped with the necessary vises, arbor presses and other smaller equipment required in bench work. At the rear of the machine shop is the receiving and shipping floor. It is served by hoists, and through a well in the ceiling, communication is had with the second floor of the plant. This is because heavy work is performed on the main floor, while smaller apparatus is taken to the second floor for overhauling.

Near one side of the receiving and shipping floor is the

raw materials store room. It, of course, is used for the storage of materials and parts for electrical apparatus of all kinds, and it might be mentioned at this time that the Jones motor repair shop is well stocked with bearings, brushes and other similar parts requiring frequent replacement.

There is another of the materials stores at the front of the second floor of the shop, where only those materials used on the smaller work are kept. Adjacent to this storeroom is a section devoted to overhauling fractional horsepower motors and other light apparatus. In this same section of the building, but at the opposite side, is the coil winding equipment. This consists of reel racks for the wire, winding machines, taping machines and coil spreaders.

Adjacent to the coil winding department is a section devoted to motor repair work. It consists essentially of one bench along the wall, with, of course, the necessary racks and tables for armatures and stators undergoing repairs. These racks are portable and the entire section is served by an overhead traveling crane that handles the work from the receiving department to the repair benches.

The remaining space on the second floor of the shop is occupied by offices and as storage space for records and equipment.

One of the necessary adjuncts in any motor repair shop is the test equipment. George M. Jones is adequately equipped in this respect, inasmuch as he can test any device under its normal operating conditions. One test panel is located on the second floor near the small motor repair

THE VIEW at the top of this page shows a section of the welding department in the motor repair shop of George M. Jones, at Scranton, Pa. The shop is fitted with an acetylene generator and the gas is piped throughout the shop. In the center is illustrated a small section of the machine department. Notice the heavy equipment and the acetylene generator at the rear. At the right is a view of part of the second floor of the shop. At the far end of the room and at the left is a test panel; in the right hand corner is the coil winding section, while the bench in the foreground is used for work on motors of medium size

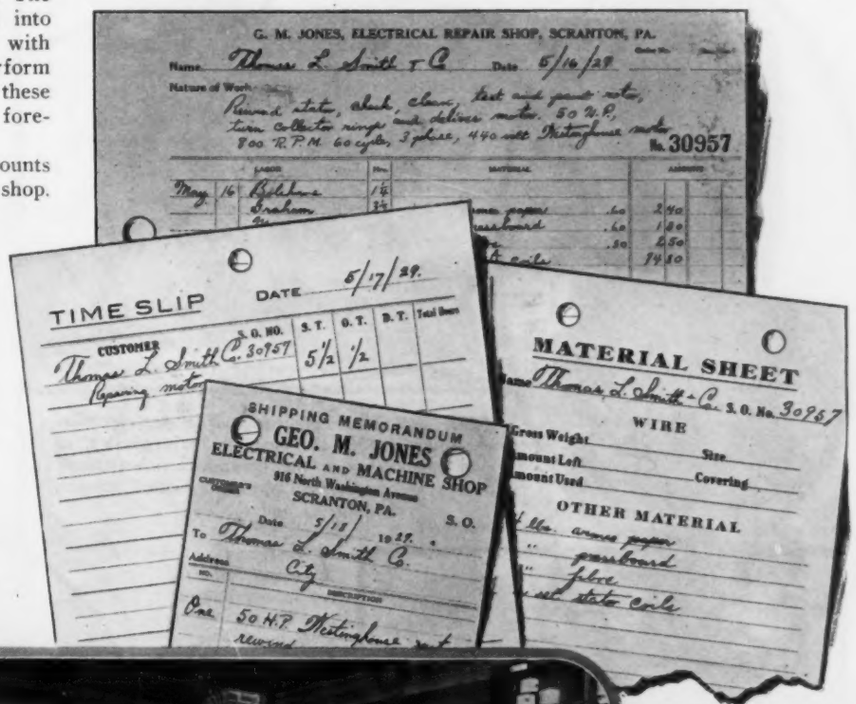
bench and the other is located on the first floor where heavy repairs are made.

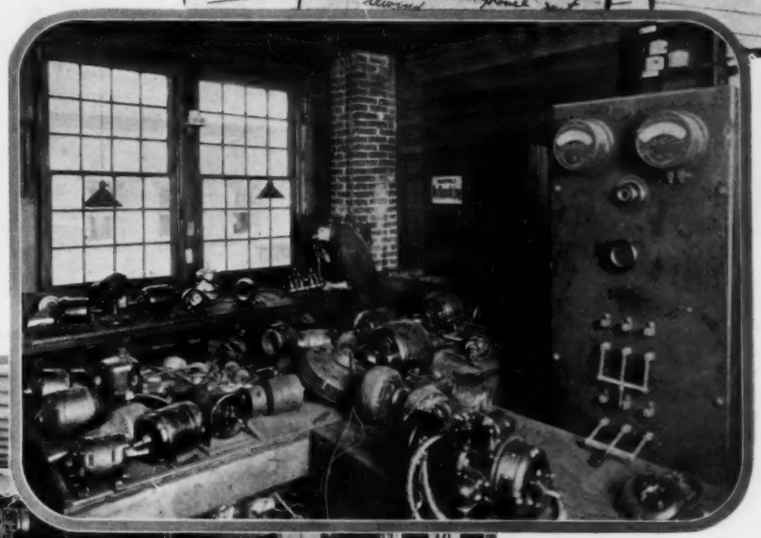
Aside from repairing electrical and mechanical equipment George M. Jones is also prepared to make industrial wiring installations, especially if these have to do with the placing or removal of electrical apparatus. Normally there are from four to six men engaged on construction work while ordinarily some 14 to 16 workmen are employed in the shop. The shop itself is essentially divided into two groups; those having to do with electrical repairs and those who perform the machine shop work. Each of these groups is supervised by a different foreman.

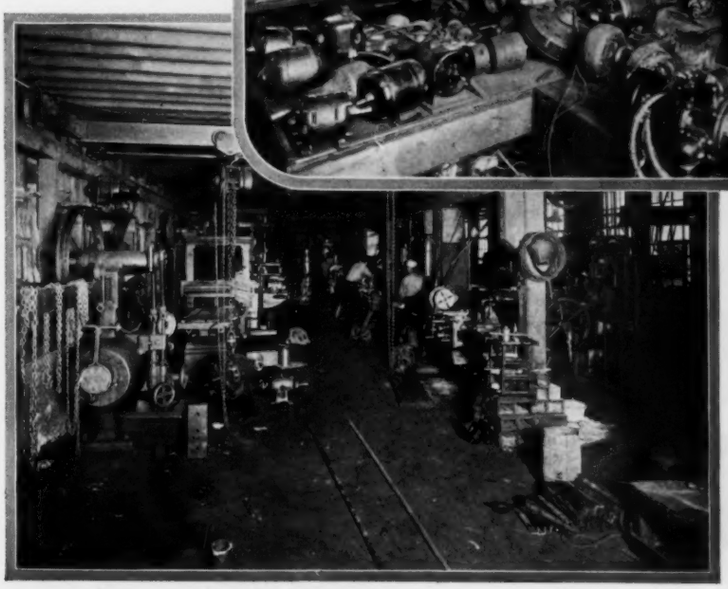
Aside from office records and accounts only four forms are used in the shop. Each workman uses a very simple form on which to record his time or labor charges against the different jobs or shop orders on which he is employed during the week. This time slip bears the workman's name, the date, the customer's name and the shop order number of the job. At the right of the form are four columns; one for straight or regular time, another for overtime, one for double time and the fourth for the total time.

Another similar form is employed to record the amounts of materials used on the different shop orders. It likewise bears the customer's name and the proper shop order number. Then, as new materials are withdrawn from storage they are listed on this slip.

Probably the most interesting of all the records employed in the George M. Jones motor repair shop is that on which an itemized statement of the full cost of all labor and materials is entered. Other than a report of what work was done on the job there are spaces in which each workman's time is entered, while other provisions are made for recording materials, drayage, shop expense and the like. These forms are the permanent job records.



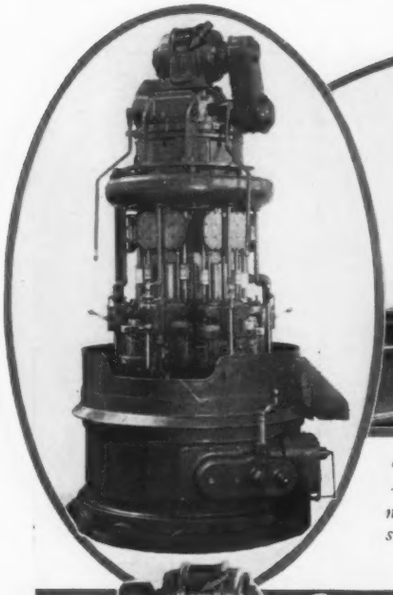


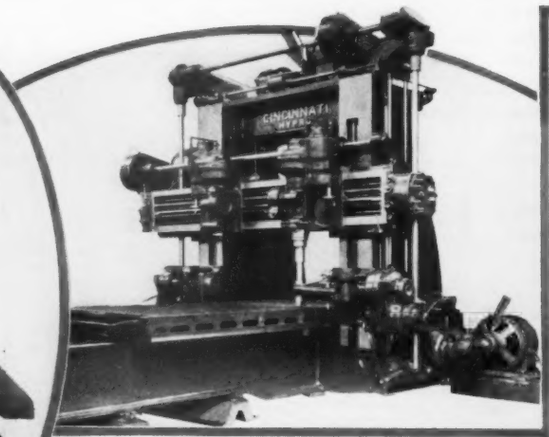


ABOVE are shown reproductions of some of the forms employed in the motor repair shop of George M. Jones, at Scranton, Pa., for recording the amounts of labor and materials used. They include only the most simple records such as a time slip, a material requisition, a shipping tag and the permanent record of the job, and these are filed for future reference

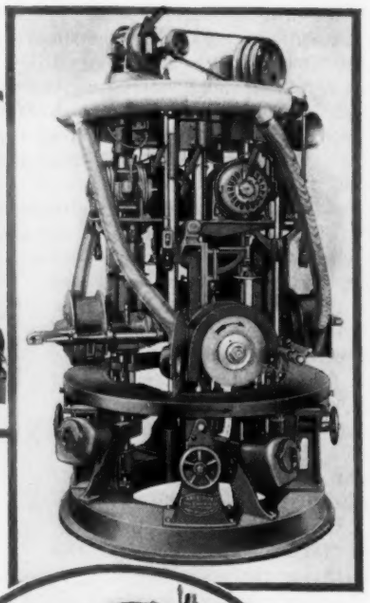
THE ILLUSTRATION in the center of the page shows one corner of the small apparatus repair bench in the motor repair shop of George M. Jones, at Scranton, Pa. At the right of this view is one of the test panels. At the extreme left is another view of the heavy machine tool department, which is located on the first floor of the shop. Notice the large planer and the heavy duty hydraulic press next to the wall. It is in this section of the shop that work is performed on such apparatus as heavy motors, generators and mine locomotives. Ample space is available in the foreground and as can be seen the entire floor is served by a traveling crane fitted with chain hoists

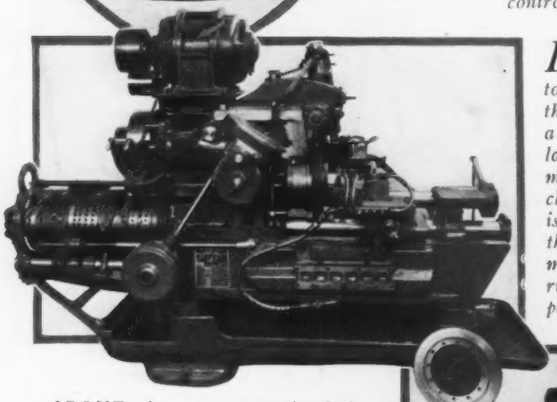
Here is a Market for



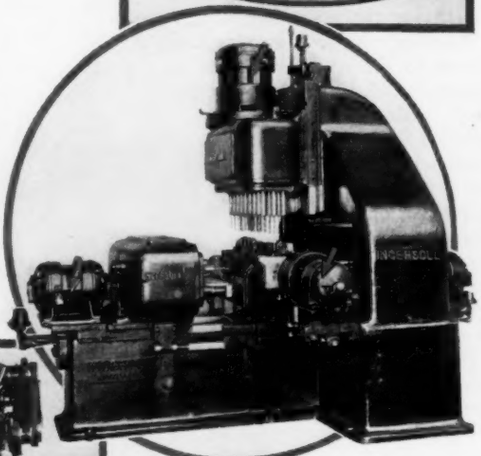


THERE is an extensive market for electrical equipment in the machine tool industry, as may be seen from the arrows, which indicate some type of electrical apparatus, either motors, controls and the like

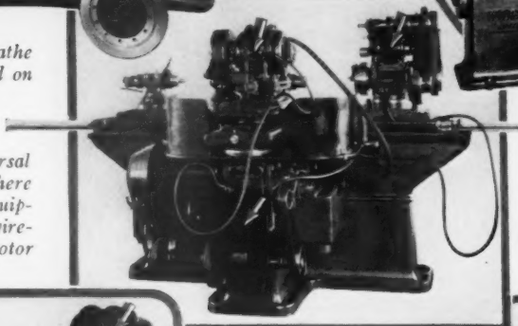




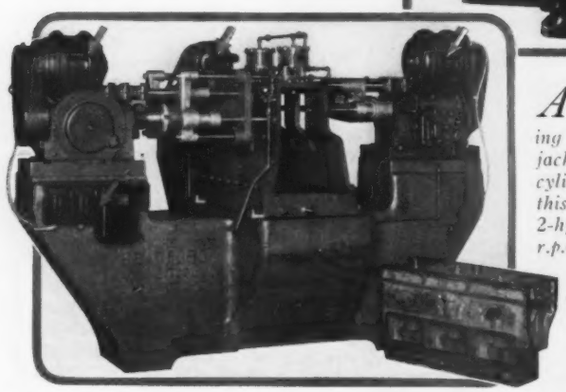
IN the three views at the top of this page, that at the left is a Bullard vertical lathe using two motors; the machine in the center is a planer having three electric motors. At the right, above, is a polishing machine



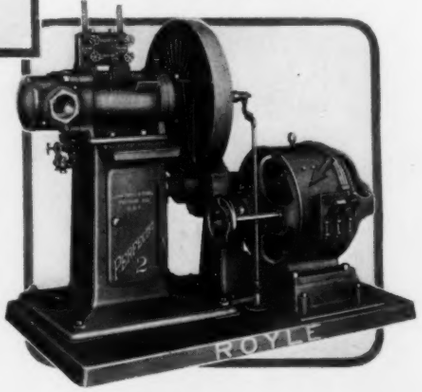
ABOVE is an automatic lathe using a 20-hp. motor mounted on the head stock. With such an installation there is the necessary conduit and control equipment. At the right is a universal grinding machine, with which there are two motors and the starting equipment. At the lower right is a wire-making machine with a 10-hp. motor



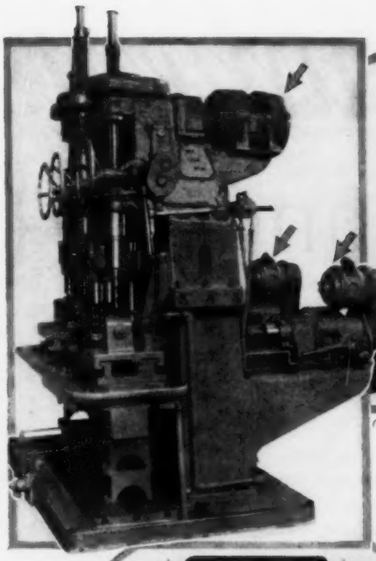
ABOVE is a four-way, 116-spindle drilling machine on which five motors are used. All of them are 3-phase constant speed, 440 volt, and the control is a compensator with push-button

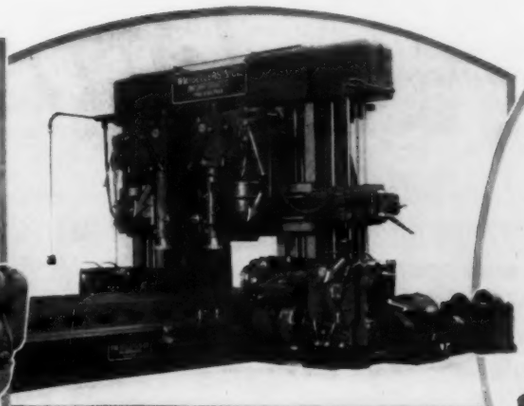


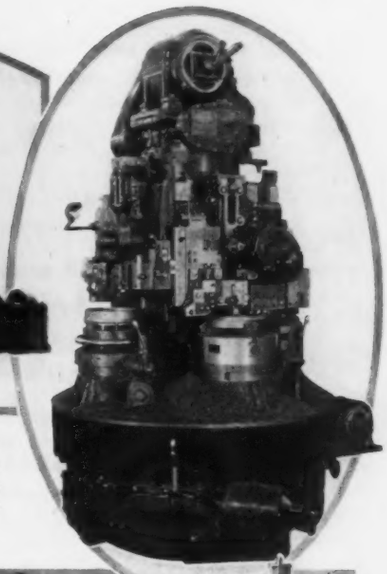
AT THE LEFT is a machine designed for drilling and reaming the water-jacket holes in automobile cylinder blocks. To operate this machine there are three 2-hp. electric motors, 1200 r.p.m., 60 cycles, 3 phase, 440 volts. They are of standard make except for the special cap and end bell. Also, notice the starting and control equipment



Electrical Equipment

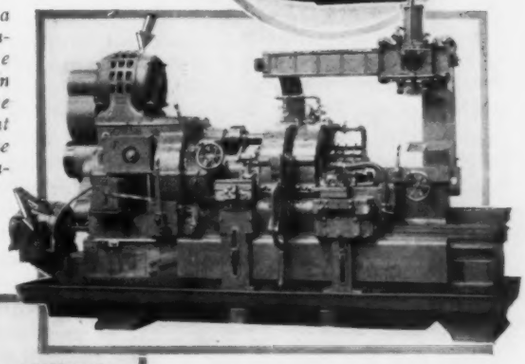




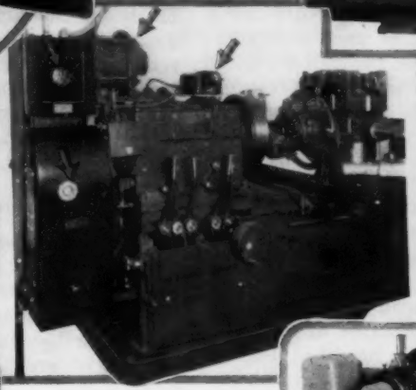


AT THE UPPER LEFT is an automobile axle drilling machine using five motors; in the center is a planer type milling machine using nine motors, and at the right is another machine having two motors

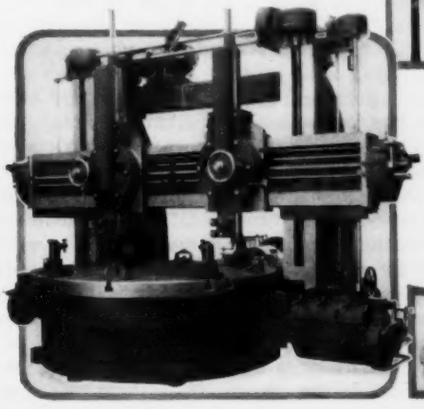
AT the left is a grinding machine with the motor mounted in the base and the control equipment on one of the doors. This machine also has a push-button control on its front



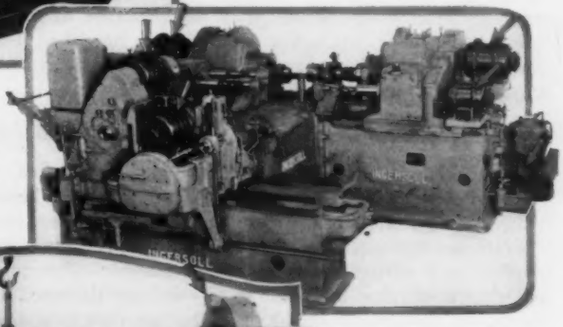
THE MACHINE shown below is equipped with three motors, one of them being 35 hp., one 7½ hp. and the other ½ hp. All of them operate on 230 volts and have three types of control apparatus. At the right is another machine using two motors



BELOW is a special milling, boring and drilling machine that is fitted with seven electric motors. One drives each of the five saddles and two drive the oil gear pumps. While this is a special machine, it serves to illustrate that there is a great market for new types of machine tools, all of which use motors and controls



BELOW is shown a swing-frame grinder. It comes equipped with 2 or 3 phase motors, 220 to 400 volts that are interchangeable



MEASURING *Instruments* and *METHODS*

No. 6 of a Series on Electrical Testing Instruments and Methods

There are graphic instruments available that will check the performance of any type of apparatus that will open and close an electric circuit. How some of them are used is explained in the following article

By D. H. BRAYMER
Consulting Engineering Editor
ELECTRICAL MANUFACTURING

IN THE articles of this series that have appeared in previous issues of ELECTRICAL MANUFACTURING the construction details of standard indicating and graphic instruments were presented, together with the principles of their operation. In what follows reference will be made to special uses of graphic instruments to secure information and data on production operations and machine performance that would be difficult to secure in as complete form in any other way.

In manufacturing of apparatus of any kind where the output must be maintained at a definite rate, the service or production recorder that provides a graphic record has a wide range of applications since it can be used on any apparatus that will open or close a circuit through a contact making device. Details of this instrument were presented in the March issue with samples of the record charts that can be obtained. Besides studying the performance of machines, this instrument makes it possible to learn definite things about the way the machine is handled by the operator, and in this way determine his fitness for the position occupied and his ability to get all out of the machine that is possible under normal conditions. This instrument will also indicate when an operator has developed habits that tend toward delays when the machine is functioning properly. Such an operator may not be aware of this fact, and if on piece work the information furnished by the graphic record will enable him to correct his habit and increase his production and his resulting salary.

General Applications of Graphic Instruments

THESE particular instruments can be applied with graphic counting, measuring elapsed time, thickness of materials that should run close to limits and many similar operations. For instance, such a graphic instrument could be applied to a turn stile to count the number of employees entering or leaving the plant at any definite time and at all times. Such a record would show the late comers and those who arrive early by relative numbers. It could be applied to doors that should be kept closed tightly and opened only when necessary, showing how many times the door was opened and for how long during any period of time.

Special Applications of Standard Graphic Recorders.—All large buildings or groups of buildings used for manufacturing purposes present management problems, either in the nature of making them suitable for the operations performed therein or to make them conform with the requirements of law as regards ventilation, sanitation and the like. This element of production cost is one that should be under close executive control, and herein the graphic instrument is a useful production tool.

In the heating and ventilating of a large building, an accurate knowledge of the operating conditions will make possible definite economies in fuel cost and in productiveness of employees by making sure that the building is neither too hot nor too cold. A graphic record of steam pressure on the heating mains or vacuum on the return lines is desirable from this standpoint as well as a graphic record of building temperatures. When ventilating fans are used as a fresh air supply and foul air exhausted, either a speed recorder on the fan if operated at variable speed, or a time recorder if operated at constant speed, will check the service of the fan and indicate if it is used to supply enough or too much cold air and too much or too little exhaust from the building.

Applications to Pumps and Compressors

IN WINTER the exhaust from a building need not under usual conditions be as much as required in summer, and when too much air is exhausted the warmth from the heating system is simply wasted. Such waste in any large manufacturing plant would pay a handsome dividend on the cost of graphic instruments required and besides improve plant conditions.

In the case of automatic pumping equipment, air compressors and the like, controlled by auxiliary devices, such as float switches, pressure gages, etc., the graphic record will indicate when these devices are in operation and for how long, providing information that is of decided value in the selecting of new and larger or smaller equipment for similar operations, thus eliminating guess work as to what may or may not be actually required. On emergency fire pumps, for example, the graphic record will indicate whether trial runs are periodically made, and the equipment ready for the expensive emergency of a destructive fire.

In the maintenance of large numbers of motors on machines and variations in the operations of these machines, a graphic record taken once a month on each motor by a

wattmeter will indicate an overload before the machine has developed trouble from this source, making it possible to replace it before an interruption in service is caused, with the resulting loss in production time. Besides, when motors are standardized these records will show which motors might be interchanged because of underload or overload condition and thus keep motor ratings balanced with the load.

Locating Causes of Trouble.—In cases of electrical troubles in motor driven machines it is sometimes difficult to determine whether the cause of the trouble is in the machine or in the motor. A graphic record will usually show any peculiarities of the duty cycle, and from this record the cause can be found.

Checking the Cost of Electric Power

THE following tests will illustrate the value and usefulness of such records. In one case trouble is experienced with the operating of hoist motors, and a graphic wattmeter was connected to get the cycle of operation. On one of the hoist motors, the graphic chart showed a swing of the needle at regular intervals. This indicated trouble in the machine, which was found to be a high spot on the brake drum which rubbed on the brake band each revolution of the drum.

Another test on an air compressor showed a similar regular swing of the needle, which was traced to a gear drive. This gear did not appear noisy, but after replacing it, the trouble disappeared. Another test on a centrifugal pump showed peculiar humps on the graphic chart at regular intervals. This was found to be due to intermittent pumping and churning of the water due to a propeller that was slipping on the shaft.

Such troubles as these would be difficult to find by an ordinary visual inspection. In the checking of machines on a test floor in a manufacturing plant, similar troubles came up, and the graphic record is widely used in such cases to secure data for changes in design or adjustments to eliminate the difficulty. In the development of new machines, the graphic record is a useful means to determine power consumption, smoothness of operation, ability to stand estimated overloads, heating of bearings and the like.

Production interruptions in a manufacturing plant are not only expensive from a production standpoint, but a source of annoyance until the cause can be definitely found.

In many cases troubles show up in a piece of electrical apparatus because such apparatus is sensible to irregularities in machine operation. In large plants it is now general practice to install graphic electrical instruments on main circuits in order to spot trouble as soon as it develops and before a group of machines is put out of operation. When the records are observed and unusual conditions appear, some simple adjustment or correction at the source of the trouble will prevent a serious production delay.

Reducing Cost of Power.—In the manufacture of a machine or device, power and labor costs are definite elements of the estimated cost of the finished product. The power cost is usually the lower of the two and so automatic machines are used as far as practical, to reduce unit costs and speed up production. The installation of such machines calls for many small induction motors in large plants and unless these motors are fully loaded the combined power factor of the feeder circuit may be very low. A low power factor in a large plant which pays its power bills on a contract calling for a power factor penalty pays an excessive amount in the form of an increase in power cost due to a power factor lower than that stipulated. In other cases the energy contract makes it possible to secure a marked reduction in the power rate if the power factor is increased to say 90 per cent.

Without a graphic power factor record, the management may be misled by increases in power bills due to low power factor, believing that such an increase is an indication of an increase in production. The error of this inference might not be discovered for a considerable period or long enough to get such production records that show up the true facts.

The following illustrations will indicate the savings in power cost that are made possible by a graphic power factor meter. In one manufacturing plant the power factor was approximately 0.55, due to a large number of small underloaded induction motors. The average load during a large part of the day was 140 kw., but the transformers at the service connection to the plant were required to carry from 255 to 280 kva., due to this low power factor. The overloading of the transformers caused a considerable voltage drop, so that the plant voltage was 425 instead of 440, resulting in a speed reduction for all motors and undue heating of small overloaded motors.

The power rate contained a power factor clause as follows: "Either the average kw. or 80 per cent of the kva., which ever is larger, will be considered the billing demand for each period." This meant that at the power factor at which the plant was operating, 80 per cent of the total kva. exceeded the kw. demand of 140 by 84 kw., and the excess kw. demand was being paid for at the rate of $1.38 per kw. Power factor correcting apparatus was installed to raise the power factor from 0.53 to 0.80. Since this apparatus was installed there has been a monthly saving of $115 on the power bill, and the voltage has been raised from 425 to 460 volts. The cost of the power factor correcting apparatus was paid for from savings in 18 months.

Determining the Correct Power Factor

IN ANOTHER manufacturing plant power was being paid for on a contract containing a power factor clause reading as follows: "The standard power factor upon which this schedule is based is: Such monthly average power factor as ascertained by instruments designed to record power factor graphically, by the use of a so-called 'reactive component meter,' which records the reactive kilovolt-ampere hours, or by other standard instruments. When using a reactive component meter, the monthly average power factor shall be calculated from the monthly use of kilowatt-hours "A" as obtained from the integrating watthour meter and the monthly use of reactive kilovolt-ampere hours "B" as obtained from the reactive kilovolt-ampere hour component meter by the following formula:

$$\text{Monthly Average Power Factor} = (2A) \div (A^2 + B^2)$$

The billed demand shall be determined each month by the following formula:

Measured demand $\times$ (0.80 $\div$ monthly average power factor)"

Power factor correcting apparatus was installed, correcting the power factor from 0.53 to 1.0. This resulted in an average saving per year of $2,700. The cost of the power factor correcting equipment was $3,500. The demand charge in the power rate was reduced from an average of $1.43 per kw. to 0.83 kw., with the average cost of energy per kw. hr. reduced from 2.1 cents to 1.64 cents, resulting in a total saving in power cost of 19½ per cent.

Such savings in power cost plainly indicate the possible reduction of unit production costs where a considerable amount of power is used in a manufacturing plant, making a product or parts for it on which the unit cost must be kept at a low figure. Such savings are made possible by the use of graphic instruments which represent an investment cost of only a very small part of the total saving possible.

The next section of this article will deal with the application of the different indicating and graphic instruments already described, to secure definite information. Circuit diagrams and instrument connections will be presented in this connection.

Motors and Prime Movers in Manufacturing Plants

Since the last biennial census of manufactures, taken in 1925, there has been a material increase in the number of prime movers, motors and generators in manufacturing establishments

THE UNITED STATES Department of Commerce announces that, according to data collected at the biennial census of manufactures, taken in 1928, the total rated capacity of prime movers, such as engines, turbines, water wheels and electric motors, driven by purchased current, in use and available for use in manufacturing establishments in 1927 amounted to 39,040,563 hp., which is an increase of 9.2 per cent, as compared with 35,766,944 hp. reported in the census year 1925; this being the last preceding year in which such a census was taken.

The largest item in the total for 1927 is 19,144,995 hp., the rating of electric motors driven by purchased current. This represents an increase of 20.7 per cent above the corresponding horsepower rating as reported in 1925, which was 15,864,638 hp. In this connection it is interesing to notice that the combined horsepower of steam engines and steam turbines was approximately the same for both 1925 and 1927.

When the totals for 1927 are compared with those of 1919 the following changes appear: The power of electric

Prime Movers, Motors, and Generators, by Number and Rated Capacity. Combined Statistics for All Industries, 1927, 1925, 1923, and 1919, and Statistics for Industry Groups, 1927.*

Group	No. of Establishments Reporting Power Equipment	PRIME MOVERS											
		Total Rated Capacity (H.P.)	Steam Engines		Steam turbines		Internal-combustion Engines		Water Wheels and Turbines		Electric Motors Driven by Purchased Current	
			No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.
All industries, total:												
1927	174,117	39,040,563	64,781	10,136,381	8,871	6,804,717	12,663	1,170,759	7,611	1,783,711	2,151,177	19,144,995
1925	167,533	35,766,944	74,667	11,433,272	7,485	5,482,468	14,354	1,185,738	8,393	1,800,828	1,723,539	15,864,638
1923	173,415	33,092,222	**90,041	**16,700,442	(1)	(1)	15,718	1,224,172	9,293	1,803,310	1,425,492	13,364,298
1919†	222,942	29,323,653	116,032	13,836,160	6,440	3,198,099	30,470	1,241,722	13,980	1,765,131	976,278	9,282,541
Industry Groups, 1927												
1. Food and kindred products	46,564	4,134,973	13,466	1,232,440	901	257,316	3,959	185,969	1,861	104,373	277,779	2,354,875
2. Textiles and their products	24,873	4,173,438	3,756	1,001,117	730	795,036	261	15,056	2,148	427,563	415,648	1,934,666
3. Iron and steel and their products, not including machinery	6,189	8,323,037	5,182	2,732,825	1,108	1,885,727	592	587,453	167	16,120	172,410	3,100,912
4. Forest products	18,830	3,366,755	16,487	1,694,371	691	529,325	2,363	56,628	561	36,944	127,259	1,049,487
5. Leather and its manufactures	3,958	419,591	1,051	152,685	72	56,254	72	4,243	39	3,912	43,565	202,497
6. Rubber products	495	786,622	270	66,054	118	199,098	9	337	23	3,415	27,507	517,718
7. Paper, printing, and related industries	25,013	3,383,222	3,246	622,659	585	525,429	521	11,397	1,999	901,663	278,115	1,322,074
8. Chemicals and allied products	7,516	3,531,233	10,540	914,548	3,293	942,326	1,092	98,580	100	214,918	95,138	1,360,861
9. Stone, clay, and glass products	7,996	2,709,131	3,272	492,147	284	462,798	1,702	101,450	148	29,637	76,313	1,623,099
10. Metals and metal products, other than iron and steel	5,254	1,219,598	685	200,674	167	222,594	188	7,516	75	7,614	66,902	781,200
11. Tobacco manufactures	807	52,385	127	18,690	8	6,401	15	1,440	9	272	11,239	25,582
12. Machinery, not including transportation equipment	11,758	3,027,926	2,317	341,359	349	406,116	981	59,250	346	20,354	270,484	2,200,847
13. Musical instruments and phonographs	405	101,955	137	32,079	28	29,801	18	728	21	366	8,351	38,981
14. Transportation equipment, air, land, and water	2,484	2,003,853	1,118	219,472	288	311,733	322	16,901	25	9,297	152,365	1,446,450
15. Railroad repair shops	2,016	1,110,821	1,862	282,252	205	146,839	145	6,525	4	482	44,314	674,723
16. Miscellaneous industries	9,959	696,023	1,265	133,009	44	27,924	423	17,286	85	6,781	83,788	511,023

*(No data in regard to prime movers, motors, and generators were collected at the biennial census for 1921.)

**"Steam Turbines" included with "Steam Engines"; data not called for separately on schedule.

†Includes data for establishments with products valued at less than $5,000. The statistics for 1923, 1925, and 1927 refer only to establishments reporting products valued at $5,000 or more, but this change in the minimum-value-of-products limit had only a negligible effect on the comparability of the statistics, except for number of establishments, as between different census years.

motors driven by purchased current increased by more than 100 per cent, from 9,282,541 to 19,144,995; the combined power of steam engines and steam turbines decreased from 17,034,259 to 16,941,098, this decrease being the net result of a decline from 13,836,160 to 10,136,381 for engines and an increase from 3,198,099 to 6,804,717 for steam turbines; the power of internal combustion engines fell from 1,241,722 to 1,170,759; and that power generated by water increased slightly, from 1,765,131 to 1,783,711.

Of particular significance to electrical manufacturers is the fact that the use of electric power generated in the plants themselves shows a somewhat rather rapid increase, the rated horsepower capacity of electric motors driven by current from generators operated by the same establishments having increased from 6,968,950 in 1919 to 10,254,638 in 1925 and 11,216,111 in 1927. However, this increase, at the rate of approximately 60 per cent for the eight year period from 1919 to 1927, was considerably less rapid than the increase of more than 100 per cent in the capacity of electric motors driven by purchased current.

One of the outstanding statements in the report of the biennial census of manufacturers is that the kilowatt capacity of generators in manufacturing establishments increased from 6,836,814 in 1925 to 7,477,560 in 1927. This figure, it is pointed out in the report, does not go back farther than 1925 as there were no relative data collected prior to that time.

The tables accompanying this article are reproduced from the report of the Department of Commerce and in them it will be noticed that of the 46,564 establishments in the line of food and kindred products reporting there was a total rated horsepower capacity equal to 4,134,973. Of this amount steam engines to the number of 13,466 generated some 1,232,440 hp. There were at the same time 901 steam turbines having a rated capacity of 257,316 hp. While internal combustion engines generated more power than that of steam engines or turbines it will likewise be noticed that there were 277,779 electric motors driven by purchased current in use in the food industries. These had a rated capacity of 2,354,875 hp. which is far in excess of that of any of the other sources of power in that industry.

Prime Movers, Motors, and Generators, by Number and Rated Capacity. Combined Statistics for All Industries, 1927, 1925, 1923, and 1919, and Statistics for Industry Groups, 1927*

Group	Electric Motors Driven by Current Generated In Establishments Reporting		Electric Generators	
	No.	Horsepower	No.	Kilowatt Rating
All industries, total:				
1927	790,470	11,216,111	19,677	7,477,560
1925	772,411	10,254,658	23,630	6,886,814
1923	616,387	8,821,403	(††)	(††)
1919†	486,805	6,968,950	(††)	(††)
Industry Groups, 1927				
1. Food and kindred products	65,441	632,279	3,047	456,971
2. Textiles and their products	149,774	1,055,680	2,729	1,005,573
3. Iron and steel and their products, not including machinery	123,512	3,605,699	1,777	1,655,846
4. Forest products	66,931	829,405	2,282	598,633
5. Leather and its manufactures	20,488	134,103	554	114,978
6. Rubber products	13,888	206,362	182	165,618
7. Paper, printing, and related industries	50,620	1,022,465	1,632	735,194
8. Chemicals and allied products	58,858	937,199	1,972	820,332
9. Stone, clay, and glass products	27,917	731,587	1,153	524,731
10. Metals and metal products, other than iron and steel	20,719	298,712	472	253,697
11. Tobacco manufactures	3,316	15,710	71	15,799
12. Machinery, not including transportation equipment	112,040	865,414	1,819	512,944
13. Musical instruments and phonographs	6,235	46,323	164	41,497
14. Transportation equipment, air, land, and water	37,998	475,832	734	348,835
15. Railroad repair shops	18,044	264,289	729	172,310
16. Miscellaneous industries	14,689	95,052	360	54,602

*(No data in regard to prime movers, motors, and generators were collected at the biennial census for 1921.)
†Includes data for establishments with products valued at less than $5,000. The statistics for 1923, 1925, and 1927 refer only to establishments reporting products valued at $5,000 or more, but this change in the minimum-value-of-products limit had only a negligible effect on the comparability of the statistics, except for number of establishments, as between different census years.
††Not called for on schedule.

Motors in Iron and Steel Plants

ON the other hand, there were 65,441 electric motors in food manufacturing establishments in which 632,279 hp. was consumed that was generated within those plants. At the same time there were 8,047 electric generators, having a capacity of 456,971 hp.

In those industries in which are included those having to do with iron and steel and their products there were 6,189 plants reporting and the total rated horsepower capacity of them was stated as being 8,323,037. Aside from steam engines and turbines this one industry reported having 172,410 electric motors driven by purchased current which consumed 2,354,875 hp. At the same time and in these establishments there were 123,512 electric motors driven by current generated in the industries reporting. The horsepower consumption of these motors was reported as being 3,605,699 and included with these there were 1,777 generators having a capacity of 1,655,846 hp.

The textile industry is also a large user of electric motors and generators. Of some 24,873 establishments reporting there were 415,648 motors in use, consuming purchased current to the amount of 1,934,666 hp. Yet, in addition, there were 149,774 motors using power generated in the establishments reporting to the amount of 3,605,699 hp. And in these same establishments there were 2,729 generators having a rated capacity of 1,005,573 hp.

Machinery, which does not include transportation equipment, is another group that is an extensive user of electric motors. It reports 270,484 motors using purchased current to the amount of 2,200,847 hp. In addition this industry has in use 112,040 electric motors with a rated capacity of 865,414 hp. At the same time there are 1,819 generators with a capacity of 512,944 hp.

Steam Engines in Use

WITH respect to steam engines in use in all of the industries reporting it will be noticed that their number has decreased since 1919 from 116,032 to 64,781. At the same time steam turbines have increased in number, from 6,440 to 8,871, while the number of electric motors driven by purchased current has increased from 976,278 to 2,151,177. In the same manner the number of motors driven by current generated in the establishments reporting has increased since 1919 from 486,805 to 772,411.

Water wheels and turbines show a decided decrease since 1919 in that their number has dropped from 13,980 to 7,611, although their rated capacity has increased from 1,765,131 hp. to 1,783,711.

Indications are, however, that there is a general trend toward the replacement of steam engines, internal combustion engines and water wheels with electric power. And, it will be noticed that there is a tendency toward the generation of more power in manufacturing establishments than that purchased.

Editorials

Be Receptive to New Ideas

IN GREAT MEN there are qualities which are common to all men. What is the quality in the creative genius which other men possess and may use if they will? The ability to be receptive to a new idea, to fuse that idea with our own thought, and thus to transform it into terms of our own experience, for the benefit of others as well as of ourselves.

Through "Light's Golden Jubilee," the world is honoring the creative genius of Thomas A. Edison. Such a creative genius as Edison is not found on every street corner. But wherever you turn—even if you become introspective and look within your own soul—you find a man who could be greater than he is if he could, or would, regard himself, not as a dam against the new ideas which are ever ready to flow through the human mind, but rather as a power station where those ideas may be transformed and stepped up into larger service for himself and others.

That is what Edison did with the incandescent lamp. Before him men had entertained the idea, and when it was fused with his mind, there came forth the first practical incandescent lamp, a blessing to mankind for all time to come.

Beside such a creative giant as Edison most of us may feel like pigmies. But the stuff of creative genius is in us, too. From somewhere outside ourselves—let your religion, your philosophy, your metaphysics, or whatever you wish to call it, say just where—the ideas flow into our minds. They are talents which we may bury there if we wish, smothering them with mental laziness; or which we may plant there in the soil of creative thinking, watering them and cultivating them with our own mental activity, that they may blossom into accomplishments which are peculiarly our own.

The man who is contractive toward the inflow of ideas, who holds them within himself or attempts to develop them for his benefit alone—he is the small man, the man who has not yet put away childish things. But the man who is expansive toward the inflowing idea, who retains it only to give it forth multiplied—he is great because he is creative. To him every inflowing idea says, "I came that you might have life, and have it more abundantly."

The Changing Business World

NOT so many years ago "big business" guarded its secrets with the utmost care. Today, they are an open sesame. Very few are the executives now that will not discuss their affairs openly. They realize that it is for their benefit to do so. Management is more broadminded than it was and that this is true is evidenced by the discussion of the activities of the American Management Association, appearing elsewhere in these pages.

While this organization is not so old in point of years it numbers among its members thousands of outstanding industrial leaders, who meet and talk freely of their businesses and their troubles. Its aim, according to the tenets of the association, is, "to promote better human relations in business." Its members realize that they must live and let live; and that to do so they must cooperate with each other in the conduct of their businesses.

Things move so swiftly in this world today that it is most essential for management to meet and talk over its problems. New problems arise daily, new elements are continually being brought into the business world and they create problems that require careful consideration and wise counsel, if "big business" is to forge ahead. And business men today are to be lauded for the open-minded manner in which they meet, talk over their troubles and help each other.

Watch Your Health Motor and Sunshine Lamp Ads

SEVERAL TIMES during the past year someone has tiptoed softly up to the editor and asked quietly, "Tell me, are electrical exercisers dangerous or not?" Usually the question has been followed by some comment to the effect that some doctor said this and some other doctor said that. In order to find out just what the doctors do say, the editor addressed a letter to the American Medical Association and asked for an official expression of opinion on the mooted question, "Are electrical exercisers, sometimes called health motors, dangerous to health or not?"

In reply, the secretary inclosed an editorial taken from *Hygeia,* which is published by the association. A portion of the editorial reads as follows:

"Among the extraordinary developments of recent years has been the public interest in the device astutely called by the promulgators a health motor. . . . The advertisements of these devices have been accepted for publication in both *Hygeia* and in *The Journal of the American Medical Association.* The claims made in these advertisements are essentially sound. Such devices do actually move muscles and thereby aid in the reduction of weight. . . . Unfortunately, manufacturers of such devices have not been content in all instances to limit their claims to the actual merits of the machines. It has been the attempt of *Hygeia* to advertise only such machines as do conform reasonably with their claims. . . . It is the attempt of these advertisements to limit advertisers to claims that are supported by scientific evidence, and it is understood that the claims made in the general literature shall not go beyond those permitted in the advertising in this publication. . . . As a cure for disease or as a panacea in all sorts of unusual complaints the use of the health motor is without scientific basis."

The manufacturers of sunshine lamps are also facing the same kind of a problem. Ambitious claims of "marvelous" health building and "wonderful" curative qualities of these products made by the manufacturers and distributors of them have reached the point of absurdity. There comes to mind the booklet of a manufacturer who presented the histories of some forty or fifty subjects who had been treated with his device and who had been cured of everything from rheumatism to insanity. Such far-fetched claims can do nothing more than breed a great distrust for all therapeutic apparatus, in the public's mind.

It is well, therefore, that manufacturers of carbon arc lamps have perceived the precarious position in which over-imaginative advertising copywriters have placed these products. The carbon arc lamp section of Nema recently adopted a resolution declaring that "in advertising and printed matter dealing with carbon arc lamps for sale to the public, curative claims shall be limited to building health to higher levels and as an aid in preventing common systematic disturbances."

In this resolution the manufacturers have taken cognizance of the warnings reiterated time and time again by medical authorities with reference to therapeutic appliances in the home. These warnings discourage self-diagnosis by the layman and stress the fact that in the treatment of specific diseases, carbon arc lamps should be used only on the advice of a physician. The burden for making these facts clear to the user rests entirely on the makers and distributors of the devices, and the manufacturers should urge their distributers to be careful in their claims. The manufacturer or dealer who casts off this responsibility casts off a boomerang—that clever little device of the Australian bushman which when thrown out is quite likely to rush back and crack one, as likely as not, squarely in the head.

Modern Finishing Methods

IT was said not so long ago that despite the efficiency of mechanical equipment and operating methods in manufacturing plants today, modern methods for finishing products were equally as essential in making possible quantity production.

Before the days of present finishing methods it was no uncommon thing for an automobile to receive ten or more coats of finish before it was ready for the market. Other products often required from two to four coats that are now being turned out with but one coat of paint.

The spray gun and finishing materials suitable for use in spray finishing have made possible this reduction in the number of painting operations. In some instances they have reduced their number by as much as 75 per cent.

Spray finishing is by no means new to the electrical industry, for many of its products are finished in this manner. But, there are many things to be known about the subject, such as the different types of spray guns, how they are used; materials and their applications, as well as the auxiliary devices required for an installation of spray finishing apparatus.

What all of these things are and how they are used is fully explained in a series of articles to be published in Electrical Manufacturing, the first installment of which will be found elsewhere in these pages.

Graphic Instruments as Production Tools

IN any manufacturing operation the main divisions of production cost per unit of output are raw material, labor, power cost and supervision. Except for spoilage the raw material element can be kept to a fairly constant figure and close to estimates of increased or reduced production. All of the other elements are variable and depend largely upon the efficiency and judgment of the human element involved. Poor supervision combined with carelessness and indifference on the part of machine operators will upset all control of production costs in the use of the best of production equipment. Herein then lie possibilities for plant executives to effect large reductions in production costs.

At the present time automatic operation of machines in so far as possible has helped to reduce the cost of supervision but in this connection the use of some check on machines and human performance is essential in order to maintain and improve the production rate. One of these checks finding a wide range of application is the graphic meter in special forms. In an article elsewhere in this issue the applications of some of these special forms are discussed.

Scientific tools of this character do work in manufacturing operations similar to the instruments and appliances used with marked results by physicians and surgeons on the human machine. Mere observation of production processes these days is not only out of date but one of the most inaccurate means that can be employed to get accurate and reliable information unless supplemented by every practical means to check wrong interpretations from these observations.

More Efficient Motor Repair Shops Needed

IN the past year more than 200 motor repair shops were visited by members of the editorial staff of Electrical Manufacturing. All of these were located in the largest manufacturing centers of New York, New Jersey and Pennsylvania, where probably more industrial electric motors are in use than in any one other section of the country.

All of these shops are large buyers of wire, insulating materials, copper, brass, bearings and impregnating compounds. Many of them have extensive facilities in the way of machine tools and other equipment. Practically all of them are combinations, in one form or another, with machine shops, automobile repair shops and welding shops.

The character of their work is as diversified as could well be imagined, as practically all of them are fitted to handle almost any kind of repairs to anything mechanical.

Yet, there was a decided appearance in most of them that conditions were not just as one would imagine they should be. Many of these shops were more or less dirty and disorderly. Most of them were poorly lighted and from all appearances poorly managed.

When some of the proprietors of these shops were questioned as to why such conditions existed they distinctly stated that they were due to too much competition, price cutting, general falling off in business and the lack of either sufficient capital or business or both to warrant further expansion or more adequate facilities.

Not one of them, though, mentioned inefficiency or possibly mismanagement. Little did they seem to realize the possibilities in this direction. Overhead, as an item of expense, seemed to mean little to any of them. Profits, when such things existed, were the difference between what the customer could rightfully be charged for the work, minus what it actually cost to turn out the job, and in many cases few of them had any visible means for determining what a job actually cost in their shops. Of course, most of them had some kind of records and cost accounting systems, but by and large, these were very inadequate.

All to the end that if this very important branch of the electrical industry is going to prosper it must awaken itself to the fact that a business will not run itself; that there are certain definite fundamentals in the conduct of any business, that modern methods, modern equipment, and, last but not least, adequate facilities, good light, clean and orderly shops with competent workmen are the very essentials with which to overcome such things as too much competition, general falling off of business, price cutting and lack of capital.

Characteristics That Determine the *Selection* of MOTORS

No. 14 of a Series Discussing Motors of Different Types

In the selection of direct current motors various types of control apparatus are available for use and this is described in the following

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IN THE previous installment of this series of articles, published in the May issue of ELECTRICAL MANUFACTURING, the various types of direct current motors were explained with discussions as to their applications for many different installations. The following has to do with control apparatus for these motors.

Speed Control—The speed of a direct current motor may be varied by either field control or armature control, or in some instances by a combination of both.

Field Control—This is known as an adjustable speed control, giving a practically uniform speed for each step of the controller. For this service, the shunt wound motor is most commonly used. The speed ranges permitted with this type of control were previously mentioned.

Armature Control—This is known as varying speed control. The resistance used for this type of control is connected directly in series with the armature so that it must be amply designed to carry the armature current. The speed of the motor on any step of the controller depends upon the load of the motor, light loads giving higher speeds than heavy loads. The use of the varying speed motor is not economical if the motor is to be operated much of the time at reduced speeds, as considerable loss occurs in the series resistance, with a subsequent reduction in efficiency.

In some cases where a standard shunt wound motor happens to be immediately available for an application or is preferred for any reason, both methods of speed control are used. The field control is employed over a range of approximately 4 to 1 speed ratio and is then supplemented by the armature resistance control to obtain addition speed control up to 6 to 1 speed ratio.

An exception to the methods of speed control just outlined is, of course, the armature shifting motor. While the method of speed adjustment is different, and the speed range wider, still this type of motor falls in to the class of field

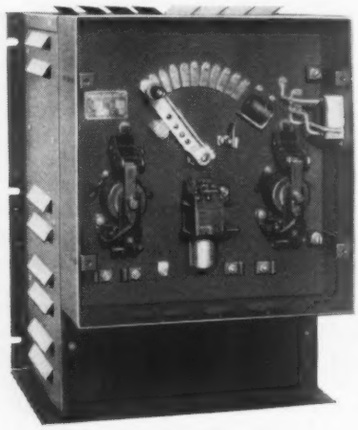


Figure 11

A rheostat of the face plate type with overload and no voltage release mounted on the plate. It is of the manually operated type and is shown here with the outer cover removed

Figure 12

This is what is termed an operator's switch of the vertical type. These are also made in the vertical type, and the space available and the nature of the application determine the form of mounting

control motors as far as inherent characteristics are concerned. This motor maintains a constant horsepower output as does the motor operated by field control.

Control Features—The control apparatus for the varying speed and adjustable speed motors plays a much more important part than is the case with the control for constant speed motors. For example, when using constant speed motors any type of controller that will bring the motor up to speed and afford it a reasonable amount of protection should be satisfactory. But in the case of varying speed or adjustable speed motors, the controller must not only accomplish this, but in addition, must control the motor at all speeds within its operating range, efficiently, smoothly and with complete safety for the operator. Further than this the controller should usually be designed to fit the application; that is, the particular service the application requires of the motor, should be taken into consideration. This will be found to be especially true when particular applications are discussed later.

In general, controllers may be operated manually, magnetically, or by a combination of both methods.

When the speed is governed by field control, the rheostat is usually of the face plate type, with overloads and no voltage release mounted on the plate. Figure 11 shows a manually operated typical controller of this type with the front enclosing cover removed.

An exception to this case is the drum type controller, where the rheostat is made up in the drum form. A separate protective panel is required in this case.

Another type of control is made up of three units: an operator's switch mounted in the most convenient place, a separate accelerating unit, that may also include dynamic braking features, and the field rheostat.

Figure 12 and Figure 13 show respectively vertical and horizontal types of operator's switches. The space available and the nature of the application determines the type of mounting to be used.

Figure 14 shows a simple form of panel arrangement, providing current limit, automatic acceleration and no voltage protection.

Figure 15 shows another typical panel, that includes the same features as shown in Figure 14 and in addition a hand re-set, adjustable overload relay, also a knife switch and enclosed features.

Figure 16 shows a radial drill driven by an adjustable speed shunt wound motor, equipped with operator's switch, automatic controller, and field rheostat with relay for speed adjustment. The accelerating panel is not shown, being mounted on the rear of the column.

The operation of this control is essentially as follows: When the operator's switch is thrown to the running position, current flows through the motor, all of the starting resistor and the coil of the first series wound accelerating contactor. As the motor accelerates the current diminishes and when it reaches the amount at which the contactor is set to operate, the first accelerating contactor closes, cutting out a portion of the starting resistor. The successive relays operate in the same manner, ultimately cutting out all of the starting resistor and connecting the motor directly to the supply lines. By moving the operator's switch handle back to its original position, the motor is disconnected and stops. Different positions of an operator's switch may provide for drifting, reversing, or rapid stop by dynamic braking.

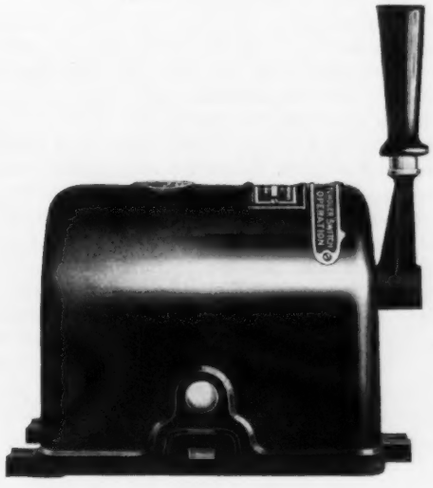


Figure 13

The construction of the operator's switch shown above is very similar to that in Figure 12. *It is of the horizontal type for applications and conditions requiring this form of mounting*

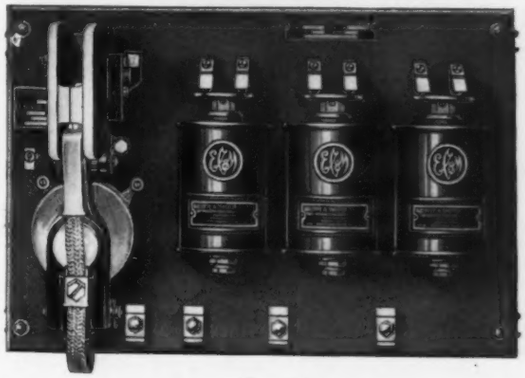


Figure 14

This is a simple form of panel arrangement in which current limiting features, automatic acceleration, and no voltage protection are provided on a very compact vertical mounting

This explanation has covered in particular one type of control that is typical and includes all essential features. It is not the purpose of this article to elaborate on control features of all types. However, the reader will become acquainted with other types of characteristic control applications, later, in connection with a more detailed discussion of particular motor applications.

With reference to starting equipment for the armature shifting, adjustable speed motor, it should be mentioned that a standard type of no voltage release starting rheostat is satisfactory for most non-reversing service, not requiring frequent starting, or a drum type starter, either reversing or non-reversing may be used. In addition, any other features may be incorporated if desired as automatic starting, dynamic braking, etc.

General Application Characteristics—Briefly, shunt wound, adjustable speed motors are adaptable to individual machine tool drives, paper and textile machinery, fans, pumps, geared elevator service and other similar applications. This type of motor may be used on any type of application where the load is fairly uniform and good speed adjustment is desirable.

Compound wound motors are adaptable to machines subject to sudden applications of heavy loads; as in punch presses, shears, etc. These motors are also used in cases where large starting torque is required and also less speed variation under load, than a series motor would supply.

Series wound motors are particularly adaptable to electric railway service, hoists, rolling mill drives, etc. Railway service, for example, requires a reasonably high speed on level track and the development of large torque for starting, accelerating, and pulling up heavy grades with the minimum amount of current taken from the line. The series motor, for such service, has the best all around characteristics.

The general nature of the applications for each type of motor has been mentioned as a basis upon which to consider a more detailed analysis of individual applications. In what follows we shall endeavor to select a few characteristic applications and to discuss them from the standpoint of motor characteristics and functions of control apparatus.

Some of the standard applications for adjustable speed motors are as follows:

1—Electric shovels
2—Reeling machines in strip steel mills
3—Rubber calendars
4—Paper calendars and cutters
5—Roll lathes
6—Crank shaft lathes
7—Planers and boring machines
8—Grinding machines
9—Tube cutting machines
10—Draw benches
11—Pump service
12—Fan drives
13—Molding machines for foundries
14—Pipe cutting and threading machinery
15—Cloth printing machines
16—Tenter frame for cloth stretching
17—Geared and gearless elevator service
18—Individual wire drawing blocks
19—Conveyor service

There are some applications particularly suitable for the compound wound motor, such as follow:

1—Punch presses
2—Shears
3—Forming presses
4—Some types of rolling mills

Other applications are solved in a very satisfactory manner by using the series wound motor such as the following:

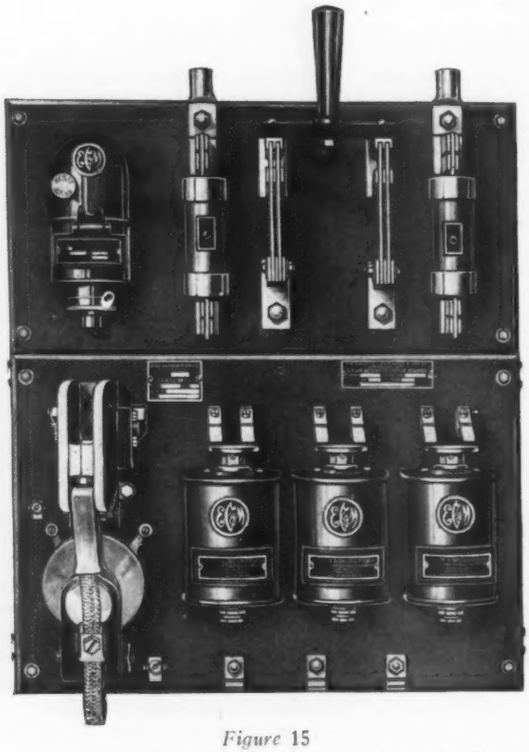


Figure 15

This control panel is very similar to that shown in Figure 14, *except that it includes a hand reset, a suitable overload relay with a knife switch, and certain other necessary features*

1—Heavy duty rolling mills
2—Electric railway service
3—Crane and hoist service
4—Car dumpers
5—Ore and coal bridges

Grouping the applications in this manner does not mean that the limits are specifically set and may not be changed. The series motor, of course, has a more limited field due to its inherent characteristics as previously explained. However, the compound wound motor can often be used satisfactorily on some of the same applications for which a shunt wound motor is ordinarily used. The shunt motor has the advantage of simple control apparatus when motor reversing is required. This explanation is included to indicate to the reader, that, while certain applications require essentially one type of motor, there are other applications where some overlapping may occur. For example, in rubber calendar drives, certain manufacturers prefer a motor with some

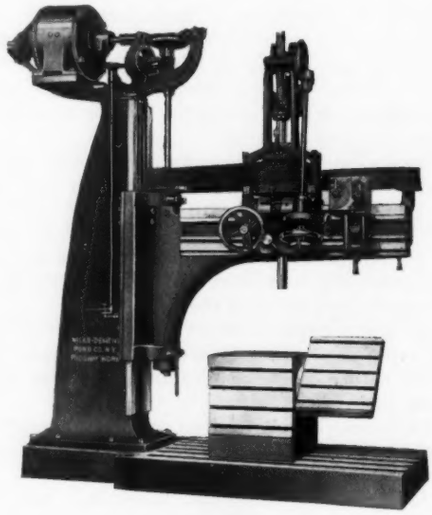


Figure 16

A radial drill driven by an adjustable speed shunt wound motor, equipped with operator's switch, automatic controller, and field rheostat with a relay for speed adjustment

degree of compounding, while others have equal success using simply a shunt wound motor.

Specific Applications to Machine Tool Duty—With early installations for machine tool drives, the usual practice was to employ a line shaft with one motor driving the shaft at constant speed. Several machine tools, drills, lathes, etc., might be driven from this one line shaft. While this method is still employed to a large extent, there is a steady increase in individual motor drives for each machine tool. A study of practically all applications in this field has been made to determine first, the proper type of motor for application, and second, the type of control apparatus best fitted for the job. It is now possible to purchase nearly every type of machine tool with its individual motor drive.

It has been found that there are many advantages in individual motor drive, whether the motor be geared, direct-coupled, or belted to the particular machine which it drives. The advantages are chiefly due to possibilities and practicability of speeding up production by proper manipulation of the motor through its control.

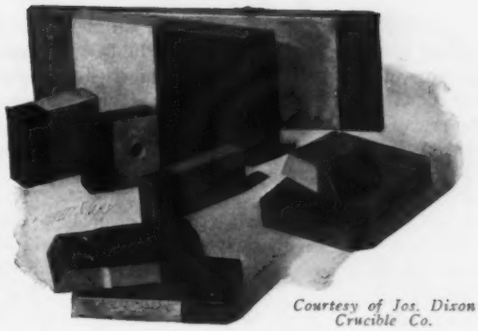
In considering motors for machine tool duty, there are two main considerations; the first being for the safety of the operator, and the second being for efficiency and production.

The development of various safety codes, and compulsory state safety laws, and control apparatus to conform to such

(*Continued on page* 70)

No. 14 of a Series of Articles on Common Materials

GRAPHITE and Its Electrical USES



Courtesy of Jos. Dixon Crucible Co.

A brief study of the sources of graphite, methods of mining, its physical properties, its uses in the electrical industry and U. S. consumption

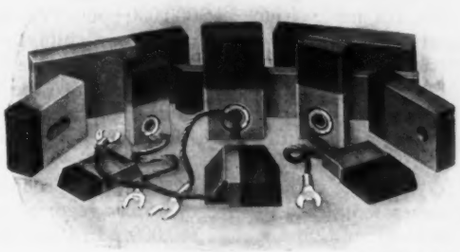
By WILLIAM CRAWFORD HIRSCH

GROWTH in the electrical consumption of graphite during the last few years has to a considerable extent offset the inroads made by the electric furnace upon what was once a major market for graphite: the crucible steel industry. Aside from such strictly electrical uses of graphite as in commutator brushes, battery fillers, electrodes, plungers, etc., an impressive part of the tonnage of graphite converted into foundry facings, paint, lubricants and kindred materials is absorbed in the manufacture of electrical products.

Chemically, graphite is a first cousin to the diamond, sharing with its more precious relative the distinction of being found in nature as a carbon mineral. The relationship ends right there, the physical properties of the two representing the sharpest contrast. Graphite is one of the softest of minerals, the diamond the hardest. While the latter is a non-conductor, graphite is a very good conductor. Graphite is black and opaque, while the diamond is neutral in color and transparent. Diamonds are found mostly in the form of perfect crystals, graphite is scaly, having perfect cleavage parallel to the surface of the scales or leaves. It is the different grouping of the carbon particles which go to make up the diamond and graphite, as well as charcoal, that are responsible for the wide disparity in their physical properties. Graphite's specific gravity ranges from 2.1 to 2.3, that of the diamond being 3.5.

Although mineralogists dissent and assert that under the microscope all graphites are crystalline carbon, commercial usage separates graphite into two classes, amorphous and crystalline. The former embraces all finely divided graphite, and the latter the coarser flakes occurring in veins or country rock and recognized by the naked eye as crystals.

Crystalline graphite is mined in Alabama, Texas, California, New Jersey and Montana. Alabama is the most important producer. One of the largest graphite mines in the world is located at Graphite, near Lake George, N. Y. The Adirondack region has many important deposits. A good many graphite properties have been idle in recent years, so far as actual production is concerned, development work, however, going forward in many spots. Michigan, Rhode Island and Nevada have been the principal producers in recent years of domestic amorphous graphite. Ceylon, Madagascar and Mexico occupy a dominant position in the graphite market. Ceylon contains vast deposits of lump crystalline graphite, Madagascar has just as extensive flake graphite properties, and Mexico is able to supply a very high-grade amorphous material. The cheap labor of Ceylon is competing with the equally cheap labor of Madagascar for supremacy in the world's markets. Chosen, the former Korea, is another important graphite producer, but the Japanese owners of the graphite properties in that country find it almost as difficult to compete with low-cost producers in other parts of Asia and Africa as do American producers. Canada has long been an important factor in the world's graphite production and has valuable deposits. A good deal of graphite finds its way from Asia and Africa to the United Kingdom, France and Germany, from where it is in part and in a more refined state reshipped to the United States. Germany is also a large producer of flake graphite suited for crucible manufacturing.



Courtesy of Jos. Dixon Crucible Co.

A high-grade graphite must be used in commutator brushes because of conductivity, freeness from grit, mechanical strength and self-lubrication

The natural graphites require cleaning before they can be industrially utilized. Hand-picking and cobbing of the ore, followed by screening, constitute the primitive method followed in some of the countries where labor is cheap. What passes through the screens is graded according to size into "chip" and "dust." In Ceylon low-grade material is washed by hand and dried by the heat of the sun. Blending the product of several mines,

so as to obtain improved quality, is another practice common in that island. Such primitive methods of preparing graphite for industrial utilization form a sharp contrast with the more or less highly mechanized procedure in vogue in American mills, where concentration is attained by mechanical washers or highly efficient oil flotation systems.

The value of graphite is generally measured according to its carbon content, the more exacting buyers stipulating 90 per cent. For electrical purposes iron is the most objectionable foreign matter found in many of the graphite ores, but these and kindred impurities are eliminated in the cleaning and refining process. Impurities, highly objectionable in some uses, are, however, really helpful in others. A graphite containing gritty silica would be hardly suitable for lubricating purposes, but would be unobjectionable for the manufacture of crucibles which usually consist in part of clay. Choice of the right graphite depends, therefore, largely upon the purpose to which it is to be put. Ceylon lump and chip find employment in the manufacture of electrodes, commutator brushes and battery fillers. The lump runs about 90 per cent in graphitic carbon and the chip about 80 per cent. Amorphous graphite lends itself readily to pulverization, an important factor in obtaining the suspension of the graphite particles in oil for lubricating purposes. Graphite "dust," ranging in carbon content from 40 to 60 per cent, is widely used in the manufacture of foundry facings, which are applied to the molds so that the castings will peel freely and cleanly on cooling.

Lubricating Qualities

THE lubricating qualities of graphite are naturally of paramount importance in the mineral's use in commutator brushes, but conductivity, freeness from grit, and mechanical strength are essentials demanded of a commutator brush in addition to self-lubrication, and these requirements make necessary the use of a high-grade graphite. In addition to the pure graphite brush (pure except for the binder to hold the particles of graphite together), which is especially suited for high commutator speeds, having good carrying capacity, medium contact drop, and low co-efficient of friction, there are other types of brushes in which graphite is used in ombination with petroleum coke and also with powdered copper in addition to the petroleum coke. These compounds, with coal tar serving as binder, are baked in kilns. Graphite is also introduced into some forms of copper gauze brushes to obtain better lubrication.

Graphite is used in powdered form in dry cell batteries to give conductivity to the mass of manganese dioxide. Besides flake graphite, dust from graphite mills and low-grade concentrates are carefully cleaned for battery use where freedom from iron, uniformity and good conductivity are essential requisites.

In compression type rheostats graphite is used in the form of disks or plates as resistance material. Additional uses of graphite are in certain contacts, in resistance rods and in plungers for dashpots as well as to some extent in carbonizing boxes for heat-treating filaments, etc.

While some electrodes for special uses are made from highly refined natural graphite, artificial graphite has a dominant position in the supply of electrodes and anodes. This electric furnace product consists of the conversion of powdered anthracite coal or petroleum coke into a graphite free from all trace of amorphous carbon. The temperature reached in this conversion process approximately 7500 deg. F. The product has a purity of 99 per cent carbon. Graphite electrodes may be satisfactorily operated at a density of up to 130 amperes per square inch, permitting the use of greater current densities with smaller electrodes than would be possible with carbon. These electrodes are easily machined and just as easily assembled by threading and screwing one part into a tapped hole in the other. The many forms of joints possible permit the use of permanent ends in contact with the metal conductors. Working electrodes can be renewed as consumed without unnecessary waste. Because of this and their resistance to chemical action together with low porosity, graphite electrodes find wide use in the electrolytic production of caustic alkalies and chlorine, the chlorination of gold ores, the recovery of copper, nickel and other non-ferrous metals. Graphite electrodes are also used in electric arc welding where they eliminate the deposit of free carbon in the weld. Disks, bushings, washers, and all sorts of small parts are made from solid rod. The artificial graphite is an active competitor of the natural product in many electrical uses aside from electrodes in which the electric furnace product is supreme.

While graphite is not a substitute for oils or greases, it is an important supplement of these fatty substances in furnishing lubrication to moving parts where friction must be reduced. For some classes of mechanisms where contact with fats is injurious, graphite is used by itself as a lubricant. An authority states that, when from 4 to 6 per cent of a properly prepared flake graphite is added to any ordinary lubricating oil, or when 10 per cent is added to any grease, the cost of lubrication is reduced by 50 per cent. This same authority points out that, where graphite is used alone as a lubricant, labor costs involved in lubrication and the fire hazard are greatly reduced. Graphite greases find considerable use in the operation of electrical machinery, as for instance in lubricating inclosed gears.

There are on the market types of oilless bushings which are cast with grooves that are packed under hydraulic pressure with a graphite lubricating compound. These self-lubricating devices find employment in the motors of vacuum cleaners and other domestic appliances, as well as in industrial equipment.

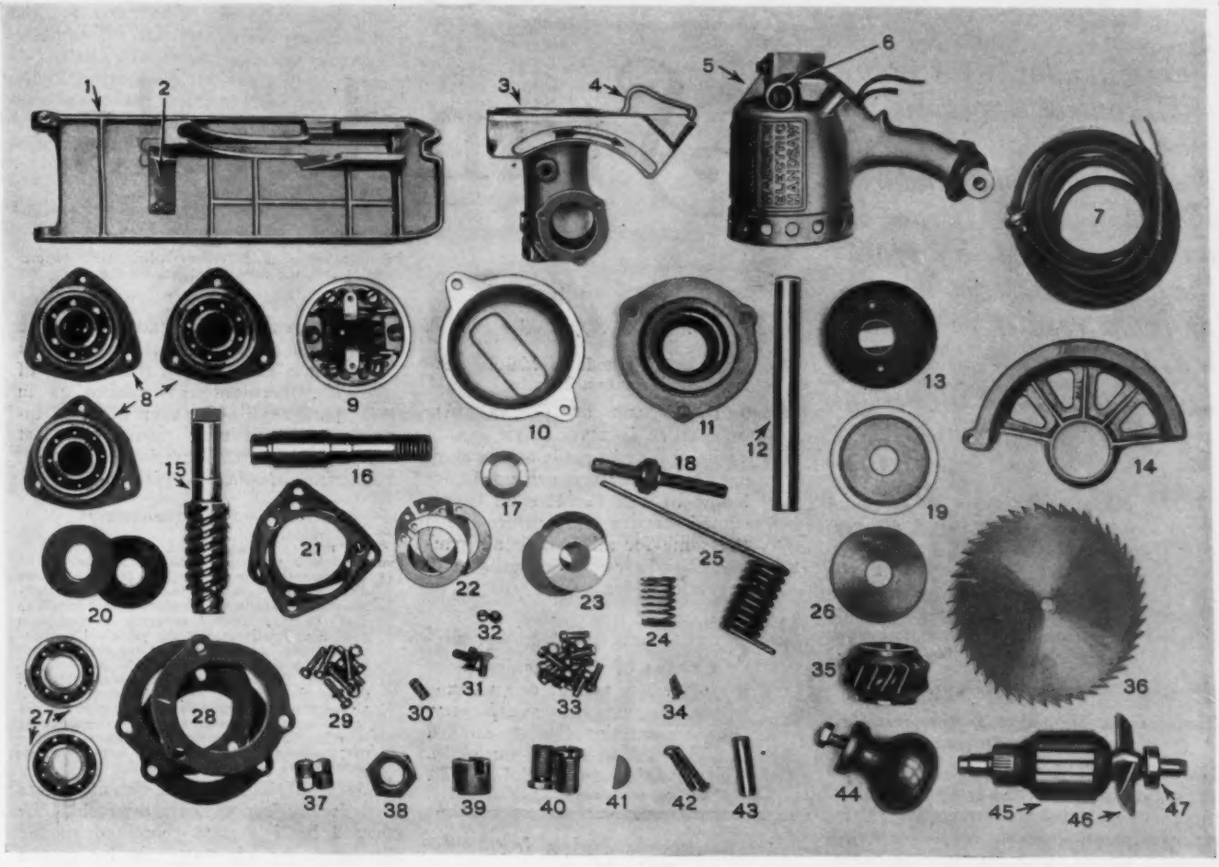
Methods of Grading Graphite

THE use of graphite as a paint material is also important. Flake graphite yields a gray color, while the amorphous gives a deep black. It dries more rapidly than lamp black. While spoken of as anti-corrosive by some paint technologists, others point out that graphite forms a galvanic couple with steel in the presence of moisture, and that, therefore, it should be used only as a constituent of the finishing coat on steel surfaces following their having received a coat of lead or zinc oxide or chromate. Mixed with a heavier pigment, graphite is generally accorded recognition as a valuable paint material.

Ceylon and Madagascar graphites are usually graded as (1) lump; (2) chip; (3) dust; (4) flying dust. Brightness and softness make for further subdivisions of these grades. Graphite is exported to the United States in 600-pound packages. Carbon content is the basis for transactions in domestic graphite, Alabama producers many years ago having formulated a schedule of grades beginning with 25 to 30 per cent carbon content and ranging upward to 85 to 90 per cent.

Imports last year aggregated in round figures 32,500,000 pounds, of which 16,500,000 pounds were amorphous and 16,000,000 pounds crystalline. Of the latter 3,500,000 pounds were flake graphite, the remainder being lump, chip or dust. The aggregate value of these imports was approximately $700,000. Before the outbreak of the European War, our graphite imports ran as high as 50,000,000 pounds a year with a value of approximately $2,000,000, and in 1917 they reached a tonnage of 85,000,000 pounds valued at $10,000,000. Domestic production was at its peak in 1918, when 42 operators reported sales of 26,000,000 pounds, valued at $1,500,000. In 1927 domestic production was approximately 5,500,000 pounds, valued at approximately $235,000. Artificial graphite production in 1923 exceeded 26,000,000 pounds, but since then has receded in keeping with market conditions. The market for natural graphite has been marked by considerable steadiness in the last few years.

Portable Electric Saw Parts



ELECTRICAL MANUFACTURING *acknowledges the assistance of J. D. Wallace & Company, Chicago, Ill., in the preparation of the illustration and table of portable electric saw components. The illustration is composed of the principal parts of a typical portable electric hand saw, and the table contains the various names of the parts and the different materials from which they are manufactured*

Table of Parts and Raw Materials Used in Portable Electric Saws

Part No.	Title	Material	Part No.	Title	Material
1	Shoe	Aluminum	24	Coupling spring	Music wire
2	Splitter	Steel	25	Shoe spring	Steel wire
3	Gear housing	Aluminum	26	Saw collar	Steel
4	Trigger	Steel	27	Ball bearing	Steel
5	Motor housing	Aluminum	28	Shutterguard bearing cap gasket	Gasket material
6	Brushes	Carbon			
7	Cord	Cord, rubber and copper	29	Machine screws	Iron
			30	Trigger helical spring	Music wire
8	Ball bearing cap	Cast iron	31	Machine screws	Iron
9	Switch toggle	Porcelain, copper, etc.	32	Plugs	Steel
			33	Machine screws	Iron
10	Switch housing	Aluminum	34	Switch cover screw	Brass
11	Shutterguard bearing cap	Cast iron	35	Worm-wheel	Bronze
12	Shoe hinge pin	Steel	36	Saw blade	Steel
13	Switch cover	Steel	37	Pipe plug	Iron
14	Shutterguard	Aluminum	38	Saw nut	Steel
15	Worm-wheel	Steel	39	Coupling	Steel
16	Saw spindle	Steel	40	Locking pin bushing	Steel
17	Saw spindle bushing	Steel	41	Woodruff key	Steel
18	Shoe stop	Steel	42	Machine screws	Iron
19	Saw collar	Steel	43	Shutterguard pin	Steel
20	Gear housing felt washer	Felt	44	Handle	Hard wood
21	Ball bearing cap gasket	Gasket material	45	Armature	Copper, steel, etc.
22	Fan housing felt retainer	Steel	46	Fan	Aluminum
23	Oil slinger	Steel	47	Ball bearing	Steel

Industrial Control Standards

These standards for industrial control apparatus include American Standards, Nema Adopted Standards, Recommended Practices and Suggested Standards for Future Design. The use of them results in greater uniformity and in improved quality of industrial control equipment

THE following article is the third in a series presenting the Industrial Control Standards of the National Electrical Manufacturers Association. This series forms a reference work of practical information concerning the manufacture, test and performance of industrial control equipment

Thermometer Method of Temperature Determination Defined

120-535 (a) This method consists in the determination of the temperature, by mercury or alcohol thermometers, by resistance thermometers, or by thermocouples, any of these instruments being applied to the hottest part of the apparatus accessible to mercury or alcohol thermometers.

American Standard—Approved 4-25-1928.

Resistance Method of Temperature Determination Defined

120-536 (a) This method consists in the determination of temperature by comparison of the resistance of the winding at the temperature to be determined with the resistance at a known temperature.

American Standard—Approved 4-25-1928.

Determination of the Mean Temperature of a Copper Winding by Measurements of Its Electrical Resistance When There Is Known the Resistance at Some Reference Temperature

120-537 (a)

Let

t be the reference temperature in deg. C.

r be the resistance at the reference temperature

R be the observed resistance.

T be the temperature sought*

*This formula is derived from the experimentally determined relation between temperature and resistance of copper.

$$\frac{R}{r} = \frac{234.5 + T}{234.5 + t}$$

The temperature rise is the difference between the calculated temperature T and the temperature of the cooling medium at time of test.

$$\text{Then } T = \frac{R}{r}(234.5 + t) - 234.5$$

American Standard—Approved 4-25-1928.

Conditions and Methods of Making the Temperature Test

120-540 (a) VALUE OF COOLING AIR TEMPERATURE DURING TESTS.

(1) The test may be made at any cooling air temperature, preferably not below 10 deg. C. It shall be assumed that the temperature rise is the same for all cooling air temperatures between the limits of 10 deg. and 40 deg.

(b) ALTITUDE.

(2) For apparatus to be operated at an altitude of 1000 meters (3300 ft.) or less, a test at any altitude within this range is satisfactory, and no correction shall be applied to the observed temperature rise.

American Standard—Approved 4-25-1928.

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120-535 Thermometer Method of Temperature Determination Defined

120-536 Resistance Method of Temperature Determination Defined

120-537 (a) Determination of Mean Temperature of Copper Winding

Conditions and Methods of Making the Temperature Tests

120-540 (a) Value of Cooling Air During Test. (b) Altitude

Measurement of Cooling Air During Test

120-541 (a) Placing of Thermometers (b) Mean Temperature

120-542 Covering of Thermometers

120-543 Measurement of Temperature During Tests

120-544 Duration of Temperature Test—Continuous Rating

Measurement of Cooling Air Temperature During Tests

120-541 (a) PLACING OF THERMOMETERS.

(1) The cooling air temperature shall be measured by means of several thermometers placed at different points around the apparatus at a distance of 1 to 2 meters (3 to 6 ft.) and protected from drafts, and abnormal heat radiation. Thermometers shall be located in the path of the cooling air.

NOTE I—Numerous experiments have shown that the temperature rise is appreciably the same in tests made at different cooling air temperatures within the range of 10 to 40 deg. C.

(b) MEAN TEMPERATURE.

(1) The value to be adopted for the cooling air temperature during a test is the mean of the reading of the thermometers (placed as in paragraph a-1) taken at equal intervals of time during the last quarter of the duration of the test.

American Standard—Approved 7-9-1925.

Covering of Thermometers†

†The most suitable method of covering thermometers in a particular case depends on:

(1) Whether the temperature is being observed during the progress of the test and the thermometer is subjected to moving air, in which case the thermometer covering should be a good heat insulator and the principal purpose of the covering is to protect the thermometer bulb from the cooling air; or

(2) Whether the temperature is being observed during the test with the thermometer in still air or after the completion of the test run, in which case the purpose of the thermometer covering is to improve the contact between the thermometer bulb and the surface whose temperature is being measured.

120-542 (a) The bulbs of thermometers used for taking temperatures shall be covered by felt pads cemented to the apparatus, by oil putty or by cotton waste.

Dimensions of felt pads for use with large apparatus shall be 4 cm. by 5 cm. by 3 mm. thick (1½ in. by 2 in. by ⅛ in. thick.) The use of smaller pads is permissible on small apparatus.

American Standard—Approved 4-25-1928.

Measurement of Temperature During Tests

120-543 (a) Temperatures of all stationary parts shall be measured during the progress of the test. Temperatures of movable parts shall be taken during the test if practicable and in any case as soon after the completion of the test run as possible. When the temperature of a part is measured during the test, the temperature shall be measured also after the completion of the test run and the highest figure thus obtained shall be adopted.

American Standard—Approved 7-9-1925.

Duration of Temperature Test—Continuous Rating

120-544 (a) The temperature test shall be continued until the temperature rises that can be observed during test have attained a steady final value; or until sufficient evidence is available to show that the temperature rises would not exceed the requirements of the standards should the test be prolonged until the attainment of steady final values.

American Standard—Approved 7-9-1925.

Duration of Temperature Test—Periodic Rating

120-545 (a) The duration of the temperature test of apparatus with a periodic rating shall be for the periods of load and rest specified by the rating and shall continue for the total time required by the rating. In every case the test shall commence only when the windings and other parts of the apparatus are within 5 deg. C. of the cooling air temperature at the time of starting the test.

(b) When ratings require tests for very short periods or at very heavy loads, the specified rating may be replaced, for test purposes, by an equivalent continuous rating or by an equivalent periodic rating of longer duration than that specified.

American Standard—Approved 7-9-1925.

Assembly of Apparatus for Test

120-546 (a) Temperature tests on control apparatus shall be made on individual elements, such as magnetic contactors, relays, resistors, etc. Temperature tests shall be made on the completely assembled element, such as a magnetic contactor, and not on a part of it, such as an operating coil without the contacts or blowout coil. The specified current or voltage shall be applied to all parts simultaneously so that the mutual heating effect of the several parts will be present.

American Standard—Approved 7-9-1925.

Temperature Tests—Enclosed Apparatus

120-547 (a) Temperature tests shall be made with enclosures in position, if enclosures are provided as part of the apparatus. In the event that the manufacturer has made tests on duplicate apparatus with and without enclosures, the test may be made without enclosures and a suitable correction made in the results.

American Standard—Approved 7-9-1925.

Temperature Test—Made by Manufacturer

120-548 (a) Control apparatus is ordinarily an assembly of standard parts or elements and temperature tests are necessary only on elements embodying new designs. In the absence of any specification to the contrary, no temperature tests will be made on control apparatus at the factory when the manufacturer can furnish records of temperature tests made in accordance with these Standards on elements of duplicate design.

American Standard—Approved 7-9-1925.

Temperature Test—Magnetic Contactors

120-549 (a) When contactors having a periodic rating have shunt or blowout coils that are required to be connected in the circuit continuously during operation, the contactor shall be tested under this condition by heating the shunt, blowout coils and other parts that carry current continuously, prior to the start of the periodic test. Under this test condition, the requirement as to initial temperature does not apply.

(b) Thermometers shall be placed on all current carrying parts, such as coils, contacts, terminals, etc.

American Standard—Approved 7-9-1925.

Temperature Test—Resistor Starters

120-550 (a) When a temperature test is made on a resistor starter, without its motor, the resistor shall be connected to a voltage that will give the initial inrush current specified, and the steps shall be cut out at equal intervals in the "time-on" period of the cycle specified; the current during the cutting-out period shall be maintained at 125 per cent of the rated value. This cycle shall be repeated once every four minutes for one hour.

American Standard—Approved 7-9-1925.

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120-571 Temperature at Which High Voltage Tests are to be Made
120-572 Assembled Apparatus

Temperature Test—Primary Resistor Starters for Squirrel Cage Motors

120-551 (a) Primary resistor starters for squirrel cage motor shall have a maximum observable temperature rise in the resistor conforming to the National Electrical Manufacturers' Association temperature limits, when subjected to the specified normal voltage and to a load, which will permit the flow of three times the normal full load current of the motor with which the starter is to be used, for a time on period of 15 sec. out of each 4 min. for 1 hr.

Adopted Standard 8-5-1925.

Limiting Temperature Rise for Coils

120-560 (a) The temperature rise of coils above the temperature of the cooling air, when tested in accordance with the rating, shall not exceed the values given in Table II. Temperatures shall be determined by the method indicated in the table or by either method where two are indicated.

American Standard—Approved 4-25-1928.

Temperature of Contacts

120-561 (a) The temperature rise of contacts above the temperature of the cooling air when tested in accordance with the rating shall not exceed the following values:

(1) Laminated contacts, 50 deg. C.
(2) Solid contacts, 75 deg. C.

(b) All temperatures shall be measured by method in Rule 120-535.

American Standard—Approved 4-25-1928.

Temperature of Mechanical Parts

120-562 (a) Mechanical parts not in contact with insulation may reach such temperatures as will not be injurious in any respect.

American Standard—Approved 7-9-1925.

Temperature of Buses, Etc.

120-563 (a) The temperature rise of buses, connecting straps and terminals above the temperature of the cooling air when the test is made in accordance with the rating, shall not exceed 50 deg. C. measured by Method in Rule 120-335.

American Standard—Approved 7-9-1925.

Temperature of Resistors

120-564 (a) The temperature rise of resistors above the temperature of the cooling air when the test is made in accordance with the rating shall not exceed 350 deg. C. when the thermometer is placed in contact with the resistive conductor, or 250 deg. C. when the thermometer is placed in contact with the embedding material. The temperature rise of the issuing air, when measured one inch from the enclosure, shall not exceed 175 deg. C. All temperatures shall be measured by Method in Rule 120-335.

American Standard—Approved 4-25-1928.

Temperature of Auto-Transformer Starters

120-565 (a) The maximum observable temperature rise of auto-transformer starters for squirrel cage motors having a rating of 200 hp. or less shall be 85 deg. C. by resistance when subjected to the specified normal voltage for 15 sec. out of each 4 min. for 1 hr. with an inductive load (0.5 P. F. or less) of three times the normal full load current of the motor with which the starter is to be used connected to the approximately 65 per cent tap.

Suggested Standard for Future Design 10-22-1925.

Dielectric Tests

120-570 (a) Dielectric tests are tests which consist of the application of a voltage higher than the rated voltage for a specified time and designed to determine the adequacy of insulating material and spacing.

Adopted Standard 6-13-1923.

Temperature of Which High Voltage Tests Are to Be Made

120-571 (a) High-voltage tests shall be made at the temperature assumed under normal operation or at the temperature attained under the conditions of commercial testing.

American Standard—Approved 7-9-1925.

Assembled Apparatus

120-572 (a) Where a number of pieces of apparatus are assembled together and tested as an electrical unit they shall be tested with 15 per cent lower voltage than the lowest test voltage required on any of the individual pieces of apparatus.

American Standard—Approved 4-25-1928.

Standard Test Voltages

120-573 (a) APPARATUS RATED AT 600 VOLTS OR LESS.

The standard test voltage for all control apparatus rated at 600 volts or less shall be twice the rated voltage plus 1000 volts.

(b) APPARATUS RATED ABOVE 600 VOLTS.

Apparatus rated above 600 volts shall be tested at 2¼ times rated voltage, plus 2000 volts, at a specified altitude.

American Standard—Approved 7-9-1925.

NOTE I—As a supplementary test, devices for outdoor use should be capable of withstanding for 10 sec. a dielectric wet test at twice rated voltage plus 1000 volts.

Duration of Dielectric Test

120-574 (a) GENERAL.

The testing voltage for all switching and control apparatus shall be applied continuously for a period of 60 sec.

(See exception in paragraph b.)

(b) STANDARD APPARATUS PRODUCED IN LARGE QUANTITIES.

Standard apparatus and devices produced in large quantities for which the standard test pressure is 2500 volts or less, may be tested for 1 sec. with a test pressure 20 per cent higher than the 1 min. test pressure.

(c) AUTO-TRANSFORMERS FOR MOTOR STARTERS.

Auto-transformers for motor starters shall be tested with the same voltage as the test voltage of the apparatus to which they are to be connected.

American Standard—Approved 7-9-1925.

Dielectric Test—Where Made

120-575 (a) Unless otherwise agreed upon, high voltage tests shall be made at the factory.

American Standard—Approved 7-9-1925.

Points of Application of Voltage

120-576 (a) GENERAL.

The test voltage shall be successively applied between each electric circuit and all other electric circuits and metal parts grounded.

American Standard—Approved 7-9-1925.

Frequency and Wave Shape of Test Voltage

120-577 (a) The frequency may be of any convenient value and the shape of the wave such as conforms to good commercial practice. Experience has shown that with the comparatively low test voltages used for control apparatus moderate variations in wave form or frequency have no appreciable influence on the effect of the test voltage.

American Standard—Approved 7-9-1925.

Measurement of Test Voltage

120-578 (a) The voltmeter method shall be used.

(b) In measuring the voltage with a voltmeter, the instrument should derive its voltage from the high voltage circuit either directly or through an auxiliary ratio transformer, or by means of a voltmeter coil placed in the testing transformer.

American Standard—Approved 7-9-1925.

Other Tests

Range of Operating Voltage for Contactors

120-590 (a) Direct current contactors shall be able to withstand 10 per cent increased voltage without injury to the operating coils and shall close successfully at 20 per cent less than normal voltage.

(b) Alternating current contactors shall be able to withstand 10 per cent increased voltage without injury to the operating coils and shall close successfully at 15 per cent less than normal voltage.

American Standard—Approved 7-9-1925.

(c) When testing a contactor for successful operation at the minimum voltage for continuous duty, the contactor coil should be subjected to the normal line voltage until constant temperature is reached, and then tested for successful closing at the minimum voltage.

Adopted Standard 5-30-1918.

Durability of Control Apparatus

120-591 (a) Parts or elements of control apparatus having moving parts or contacts subject to burning shall be capable of withstanding suitable endurance tests (depending upon the class of service) for mechanical durability, arc rupturing ability, or both. Tests to determine the sufficiency of the apparatus from this standpoint will be made by the manufacturer and will not be required on elements of duplicate design.

American Standard—Approved 7-9-1925.

Tests for Successful Operation

120-592 (a) All control apparatus, completely assembled at the factory, shall be tested to determine the correctness of sequence of operations, current values at each control point and the mechanical adjustments. In cases where a combined test of motor and control is not specified, the test to determine successful operation may be made by applying rated voltage and current to the control apparatus, and measuring currents at intermediate control points.

American Standard—Approved 7-9-1925.

Combined Tests of Motors and Control

120-593 (a) Combined tests of motors and control to determine the correctness of operation shall be made only when such tests are specifically arranged for.

American Standard—Approved 7-9-1925.

Manufacturers' Specifications

Overload Protection

120-601 (a) Overload protection of motors; above 5 hp., at 115 volts, or larger than 10 hp. at the higher voltages; shall be provided by a contactor with overload relay or some sort of circuit breaker which shall respond to excessive current on one side of direct current and single phase alternating current circuits; and to excessive current in two sides of polyphase circuits. Fuses may be used for the protection of smaller motors.

Recommended Practice 5-23-1919.

Low (or Under) Voltage Protection

120-602 (a) Where the restarting of a motor on the restoration of voltage may cause damage or injury, low (or under) voltage protection shall be furnished. For all other cases either low voltage release or low (or under) voltage protection shall be furnished.

Recommended Practice 5-23-1919.

Taps for Auto-Transformers

120-603 (a) Standard small auto-transformer starters (50 hp. and smaller) shall have taps at approximately 65 per cent and approximately 80 per cent as determined under load conditions.

(b) Standard large auto-transformer starters (larger than 50 hp.) shall have taps at 50 per cent, 65 per cent, and 80 per cent as determined under load conditions.

(c) For determining load conditions, the average stalled motor current shall be assumed to be six times normal current at full voltage. The load taken from the different taps shall be based on the relation of the tap voltage to the normal line voltage, and the load shall be inductive with a power factor of 50 per cent or less.

Recommended Practice 8-5-1925.

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120-603 Taps for Auto-Transformers
120-604 Marking of Auto-Transformers
120-605 Marking End Connectors for Resistor Units

Marking of Auto-Transformers

120-604 (a) The taps and the coils of auto-transformer motor starters (or compensators) shall be marked as indicated in paragraph (b).

(b) The end of the winding which is connected to the Y or delta point, and which is the start of the winding, shall be marked 0. The intermediate taps shall be numbered 1, 2, 3, etc., number 1 being the low voltage tap. The end connection which goes to the line shall be marked F.

Recommended Practice 5-27-1926.

Marking End Connectors for Resistor Units

120-605 (a) Where a resistor is made of two or more units and it is necessary to connect these units together, the use of the letters "A" to "A," "B" to "B," etc., is recommended.

Recommended Practice 5-2-1916.

Nema Maps Out Future Course

Continued from page 27

and cost of materials, 57 cents. These figures, while they do not apply specifically to other industries are generally applicable and definitely indicate the importance of the purchasing end of the business.

"In order that there may be no misunderstanding I will give you two definitions: (1) Purchasing does not mean the right of selection—it does mean the right of questioning and suggesting; (2) Purchasing is not a bargaining or a dickering matter—in other words, purchasing may be defined as an effort to obtain the right quality at the right time with the best service at the right price.

"The modern purchasing department is organized so that the buyer may know what he buys," Mr. Gushee continued. "Other important functions are handled by the order, inspection, economic, and statistical divisions.

"Salesmen are received by members of the order division where the actual purchasing is done. It is essential that detailed reports of interviews of the salesmen should be made. This department is organized into groups on a specialist basis. The knowledge of materials, sources, the manufacturing plant, and adjustments is essential. All this is in an effort to arrive at the guide to the right price through cost analysis by which we proceed from the unknown factors in price to the known.

"The inspection division carries on a study of materials and supervises inspection. As a matter of fact, fair inspection is very essential and helpful to the vendor.

"One other interesting branch of the purchasing department is termed the economic division. Statistics, which are the vital part of purchasing, are collected and analyzed in this division. This includes tabulation of best prices, listing and charting of markets, commodity indices, financial reports on catalogs for the use and benefit of the buyer."

Price Giving Evil

IN closing, Mr. Gushee spoke of the vital problem of economic prosperity—price giving, which he termed the blood descendant of price fixing.

"Fortunately, the law of supply and demand usually reigns," said Mr. Gushee, "but there is often a producing capacity greater than demand and perhaps a still greater production capacity. Whenever there is real overproduction there will be price cutting. In general, purchasing should be made an economic function instead of a haphazard activity."

In a brief report on "Nema from the Viewpoint of the Managing Director," Alfred E. Waller outlined the significant phases of the association activity, under the general headings of staff, statistics, standardization, code development, publicity, section activities, membership efforts, constitutional changes, educational problem and new trends.

In connection with significant developments in the electrical manufacturing industry, Mr. Waller stated that he had been greatly impressed recently by the extent to which scientific fact finding in manufacturing has developed within the last five years.

"I can well remember when research laboratories and scientific investigations were considered a useless expense by many manufacturers," said Mr. Waller. "Today practically all of the progressive manufacturers are proud of the scientific way in which they are improving their products and their methods of manufacturing. Like the farmer, the manufacturer today is tending toward a diversity of products. I believe it is a healthy trend. I believe that what we most need for the future of the electrical manufacturing industry is fact finding, constructive thinking and planning not for the immediate present, but for the future, in order that we may have strong and healthy markets five years hence, and ten years hence and many after that."

In a meeting held after the conclusion of the Policies Division session, formal approval was given by the Board of Governors of the National Electrical Manufacturers Association to the reorganization of Nema divisions each composed of a number of sections, or manufacturing industries, having related interests. This action is in accordance with the new constitution and by-laws and is designed to more closely coordinate section activities.

The divisions which have already been organized and are now formally approved are the appliance, insulating material, radio, refrigeration, transmission and primary distribution, utilization and control, wiring devices and wiring materials. Two of these—the radio and appliance divisions—are retained from the original organization structure as is the group of executives termed the Policies Division which considers the problems of the entire association. Contrasted with the latter the other divisions named may be termed product groups.

An industrial heating division and a lighting division have also been authorized but are not yet organized.

The newly organized refrigeration division took steps to obtain statistics on manufacturers' production and dealers' sales. These figures will be collected from the member companies, representing approximately 70 per cent of the industry's production. This information will be compiled quarterly and will be made retroactive to the first of the year. It is also expected that data will be obtained from some manufacturers of the larger commercial machines.

Refrigeration Division Plans

THE questionnaire to manufacturers will contain headings covering, among others, complete data on units made by each company, listed in their respective sizes by ratings of cubic content, dairy coolers, ice cream cabinets and water coolers.

The refrigeration division has also announced plans for cooperation with the Department of Commerce in the collection of dealers' sales figures. Marshall T. Jones, chief of the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, will supervise this activity.

Through this cooperative effort it is expected that the electric refrigeration industry will be greatly aided in its market and territorial analyses since the dealers' questionnaire will show figures relative to population groups in towns and States. A comprehensive list of dealers in electric refrigeration in the United States is being prepared.

The spring meeting concluded on May 25 with a meeting of the Heating Appliance Section. During the week the Board of Governors held three meetings and in addition there were also meetings of the Section Council as well as of a large number of Nema sections and committees.

Progress in Generator Design and Practice

*Following is the third installment of a series of articles treating with developments in the design and construction of electrical equipment**

IN the first of this series of articles, published in the April issue of ELECTRICAL MANUFACTURING, abstracts from statements made by the Allis-Chalmers Manufacturing Company and the American Brown-Boveri Electric Corporation, outlined new developments in the design and construction of electrical equipment for the year 1927-1928 by those companies respectively, while the following is the second of an installment of the series abstracted from a similar statement made by the General Electric Company, as part of a report of the Electrical Apparatus Committee of the National Electric Light Association, as prepared by its Generating Stations Subcommittee.

One of the large synchronous converters constructed with rolled steel frame is shown in Figure 8, the design being typical of all new, large, direct-current generators, motors and converters.

On smaller converters and practically all motor-generator sets, the bases of the units are built of structural-steel shapes. Bases of this type are easy to assemble, require no patterns and are stronger than those of the cast type.

There have in the past year been no other mechanical advances of sufficient importance to warrant their being mentioned in this report.

Some of the early insulating varnishes were made by the dissolving of natural resins in alcohol or similar solvents. Such insulating media are characterized by a yellowish transparent color and are the so-called copal or shellac varnishes. Whereas these varnishes present an excellent appearance when first applied and so long as kept at low operating temperatures, it is unfortunately the fact that they ultimately lose their insulating properties due to their becoming dry and brittle, with consequent developing of cracks. Another defect of the yellow varnish as a base for insulating compounds is its hygroscopic quality.

The so-called black or bitumen varnish was developed some years ago by the research laboratory, which is even now engaged in an attempt further to improve this varnish, especially in its application to higher voltages and higher temperatures. At the present time the use of black varnishes has almost entirely replaced the use of yellow varnishes, the latter now being used almost solely for protection against oil.

The new varnishes are obtained by permanently combining mixtures of pure drying oils with either natural or artificial asphaltic compounds. The black varnishes have important advantages over the yellow varnishes in respect to flexibility, dielectric losses, resistance to heat and to moisture, and general insulating qualities.

The aging and plastic qualities are the ones which particularly distinguish the black varnishes from those of other types. These qualities result from the fact that each of the varnishes contains a great many constituents having slightly different boiling points. It therefore follows that, when one of these black varnishes shall have been heated to any given temperature, the low-boiling-point constituents will be slowly evaporated, while others will be in a soft state and still others will remain reasonably firm; the result being that, no matter at what temperature within reasonable limits the varnish shall have been aged, some elements will not have been heated to their flow point and the varnish will have preserved its flexibility of insulation throughout the process. The ordinary difficulties with a varnish base are that, on the one hand, if its flow point is such as to produce a firm compound at room temperatures, it will lose by evaporation a considerable number of its constituents at an increased temperature and will consequently become brittle, and that, on the other hand, if its flow point is such as to produce a firm compound at high temperatures, it will not become dry at room temperatures. It has been found, however, that some black varnishes will become thoroughly dry at room temperatures in approximately four hours and at 100 deg. Cent. in approximately two hours, although further baking at the latter temperature will not destroy their desirable properties. Tests have shown that such varnishes on field coils, when baked at 200 deg. Cent. for forty-eight hours, remain intact and still possess very good adhesive properties.

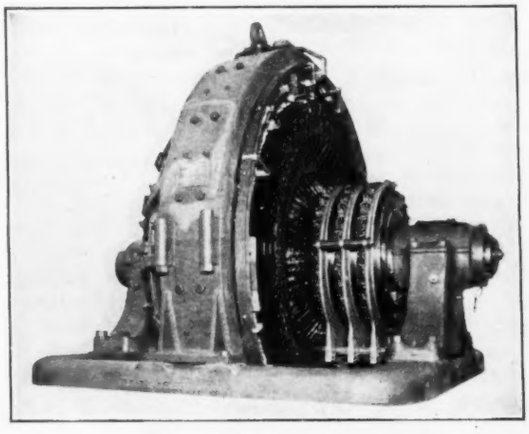

Figure 8

Typical of the new trends in electrical construction, due to advances in the art of welding and the use of welded steel construction, is this 4000-*kw. General Electric synchronous converter with a rolled-steel plate frame*

*Abstracted from a report of the Electrical Apparatus Committee of the National Electric Light Association as prepared for the year 1927-1928, under the auspices of its Generating Statistics Subcommittee.

In conclusion it may be stated that, as a result of experiments, the black or bitumen varnish has become the standard for insulating compounds except when the insulation is to be immersed in oil, as in transformers. All the insulation used in the armature of generators, whether mica or varnished cambric, is now applied with black insulating varnishes, whose dielectric properties have lasting qualities far superior to those of the yellow varnishes. In fact, for this class of work, yellow varnishes are used only in the turn insulation of some of the field coils, which require adhesive qualities rather than dielectric properties. Shellac itself is used only in binding, where the cementing qualities are required for forming the strands of the bar or coil.

Within a relatively short time, enormous strides have been made in the development of generators and steam turbines. Rated capacities of single machines have increased to such an extent that the currents to be handled would greatly exceed the capacities of standard disconnecting switches and circuit breakers if the generators should be operated at voltages as low as 14,000. It has been found that generator voltages can be increased a certain amount with much less difficulty than would be encountered in developing circuit breakers of proportionately greater current-carrying capacity.

New Types and Designs of High-Voltage Machines

IN 1918, two 12,500-kv-a., 22,000-volt, three-phase, 50-cycle, 500-r.p.m. synchronous condensers were sold to the Andhra Valley Power & Supply Company, Ltd., of Bombay, India. These condensers have been operated for eight years in an atmosphere of great humidity and high temperature without armature insulation failure.

In 1926, the Southern California Edison Company purchased two 100,000-kv-a., 16,500-volt, steam-driven turbo-generators, which are probably the first large generators purchased in America for operation at voltages decidedly higher than 14,000. The first of these two units has been constructed and is undergoing factory test at the time of this writing.

Several machines have been purchased for operation at 22,000 volts. A cross-compound unit rated at 235,000 kv-a. is now being built for the State Line Generating Company. A 61,765-kv-a. generator for the Super-Power Company of Illinois has already been shipped, after having been completely assembled and tested at the factory. All the high-potential tests, including the A. I. E. E. test of 45,000 volts, were made on the latter unit with no more appearance of distress than is to be noted in the standard tests upon 14,000-volt generators. Before the building of any of these units, tests were made to assure the engineers that no serious trouble should arise as a result of the high potential at which the stator windings would operate. Extra insulation was necessarily required, and certain changes were made in its application; however, no changes were made in the insulation itself. The extra insulation, unless the current density is reduced, increases the temperature difference between the copper and the cooling medium with respect to the difference existing in generators of lower voltage.

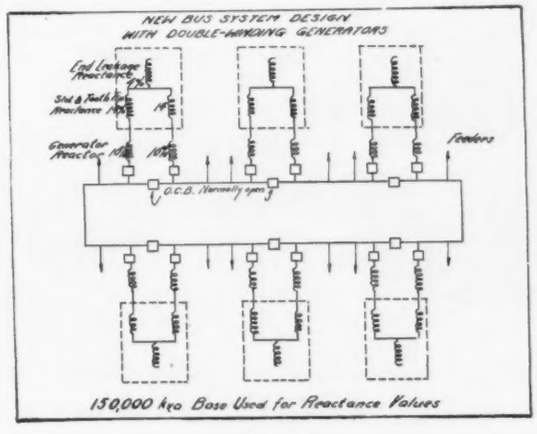

Figure 9

A one line diagram of a bus system with double-winding generators which is typical of this form of construction now coming into general use with the new methods of welded-steel construction

Comparisons of Construction and Operating Costs

IT is to be expected that generators, especially the smaller units, are more expensive when wound for 22,000 volts than for 14,000. More insulation is necessary, greater coil cross-section is required, a larger core is desirable, and the generator must be somewhat more liberally designed in respect to overall dimensions and weights than the generator of the same capacity wound for a lower voltage. However, under certain conditions large units wound for operation at high voltage are practicable and should be installed in preference to machines of lower voltage, with their consequent undesirable operation and increased cost of disconnecting switches and circuit breakers.

For the last three years turbo-generators have been built with transposed bar windings wherever it has been possible so to do. In fact, many of the units previously placed in service with windings of the old type have been rewound with transposed bar windings, such rewinding, due to the fact that the space taken up in the slots for insulation is decreased, allowing the rating to be increased as far as the armature is concerned; when the fields on such units could be rebuilt and their current-carrying capacity increased by such means as grooving the rotor, the unit ratings have been increased.

The transposed winding lends itself primarily to one-turn bars, since it is almost impossible from a mechanical point of view to make a multi-turn coil having the same type of transposed conductor. The bars under all the poles are placed in series on units of average size in order to secure the customary normal voltage. However, on larger units, voltage conditions are such that it becomes necessary to use divided circuits for normal voltages. On the small units of high voltage, it is necessary to use the multi-turn winding to secure the proper voltage.

The transposed bar is made up of a number of copper strips, these strips varying in width from 0.15 in. to 0.4 in., and in depth from 0.08 in. to 0.12 in. The width of the bar is always equal to the width of two of these strips, and the depth of the bar is determined by the current-carrying capacity necessary, the conductor on the larger units being from 15 to 24 strips in depth. Each individual strip of copper is insulated with asbestos, which is not only fire-proof but has sufficient insulation to prevent short circuits between strips, the multi-strip conductors being carefully tested to insure freedom from short circuits.

The method of transposition of the strips in the conductor is such that equal voltage is induced in each strip by the flux which leaks across the slots. Hence, there is no resultant voltage to cause circulating current in the conductor, and the transposed bar, therefore, has extremely low load losses.

As the bar is molded, it is wrapped with layers of mica tape, and is given a vacuum and compound treatment intended to dry the insulation and fill all the voids with compound. The bar is then wrapped with additional layers of mica tape, applied with a black varnish, until it is thought that sufficient layers have been applied safely to withstand the voltage of the generator. The bar is then given another compounding, followed by the application of a so-called stay binder. The final treatment con-

sists of a wrapping with asbestos tape for the full length of the core, this tape serving as a combined mechanical protection and corona shield.

The use of bar windings permits the removal for repair or replacement of the top conductor without disturbing the remainder of the winding, whereas in the case of the coil winding it is necessary to disturb a considerable number of coil sides whether the defective coil side is in the top or the bottom.

Developments In the Double-Winding Generator

IT should be noted that the transposed bar is seldom used on salient-pole machines, since most units of this type require a multi-turn coil of more than two turns per coil, and since the inverted turn, whose load losses are almost as small as those of the transposed bar, presents considerably less difficulty in manufacture.

One of the outstanding developments of the year in the line of power generation is the double-winding generator. This machine has two completely independent windings, arranged in alternate slots and so connected under the poles that the terminal voltage of the corresponding phase of each winding is in phase with and numerically equal to that of the other winding.

Like the generator of higher voltage, the machine with divided circuits is the result of a demand to keep generator currents down to their present order of magnitude regardless of increases in unit capacities, in order that the disconnecting switches and circuit breakers so far developed will remain of adequate capacity. Although it was at first planned merely to divide the generator winding into two circuits, the idea was conceived, after a study of the design of the unit and its application to the central station, of using it in a bus arrangement similar to that diagrammatically shown in Figure 9. It has been found possible under such conditions entirely to eliminate the necessity of installing bus reactors, since there is normally no electrical connection between bus sections and any transfer of kilovolt-amperage from one bus section to another must be made through the two generator circuits. It can readily be seen that the series reactance of these two circuits is interposed between bus sections, with a resultant greatly reduced value of short circuit on either bus. It can also be seen that, since the two generator windings are in the same structure and are therefore energized from the same magnetic field, they cannot fall out of step, and the reactance thereby introduced between bus sections in no way reduces system stability.

In the past, two types of double winding have been considered, of which the first consists of two complete and independent windings in the same stator, each having two coil sides in every slot. Windings of this type are very expensive and are used mostly for multi-speed motors; it can readily be seen that the increased cost of installing four coil sides instead of two in every slot, and of making the corresponding end connections, is a considerable item, and that the cost of insulation is, to all intents and purposes, doubled by doubling the number of coils. These windings cannot be satisfactorily used in the double-winding generator, regardless of cost, since the two circuits would have slightly different values of reactance.

The second type of double winding consists merely of two circuits obtained by placing the coils under one-half the poles either in series or in multiple in each circuit. Such a winding, when arranged with coils under alternate poles in series so that the effects of uneven magnetic densities caused by rotor eccentricity, lamination joints and the like are as far as possible obviated, has been found very desirable for use with what is known either as split-conductor or interwinding differential protection. Unfortunately, however, two-circuit windings of the second type are impracticable for use in the double-winding generator; the placing in series of coils under alternate poles renders the series reactance between circuits of a high value, and adds greatly to the length and complexity of the pole connectors; the grouping together of coils under adjacent poles, or a separation of the coils under each pole of a two-pole unit, renders imminent the setting up of a prohibitive mechanical vibration as a result of the severe magnetic unbalance occasioned by the slightest inequality in loading.

What may be termed the third type of double winding, viz., the one originally mentioned herein and diagrammatically shown in Figure 10, has permitted the introduction to the central-station industry of the double-winding generator. It can readily be seen from the illustration referred to that, whereas one winding always leads the other by one slot pitch under any given pole, two voltages are obtained which, as previously stated, are always in synchronism. It should be noted that, since each winding is uniformly distributed around the complete periphery, only perfectly balanced magnetic forces are produced. Another advantage in this method of winding is that no additional insulation or space is required, except for the additional number and special arrangement of the end connections and leads.

Characteristics of Double-Winding Generators

IN calculating the characteristics of the double-winding generator, it is convenient to make use of the equivalent-circuit theory so familiar to all central-station engineers. Reference to the equivalent circuit obtained will suffice to show that power can be transmitted through the double-winding generator for the bus layout shown in Figure 9.

Whereas it is of course necessary, in 13,200-volt generating stations whose units are rated at less than 135,000 kv-a. each, only to use one oil circuit breaker for each generator and, therefore, the use of the double-winding generator can eliminate only one breaker and one reactor for each bus section of a single ring bus; it is necessary, on the other hand, to use two breakers for each larger generator, and it is possible to eliminate two breakers and one reactor. However, in addition to the saving in number of breakers, there is a considerable saving in the interrupting capacity of the breakers required. As a matter of fact, such a generating station as is shown in Figure 9 has only approximately one-half the interrupting duty imposed on its breakers for a bus fault as would be imposed by the same number of single-winding units with

(Continued on page 70)

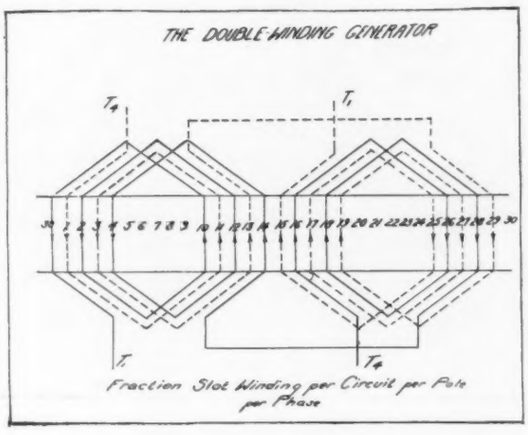

Figure 10

Here is a schematic diagram of a double-winding generator built by the General Electric Company. This is one of the outstanding developments of the year in this type of machinery construction

Let us answer the question "*Can you make it of Vulcanized Fibre?*"

If you are unacquainted with the physical properties, the machining qualities and the cost of vulcanized fibre applicable to *your* products, put it up to us to find out.

Our experimental department has shown many a busy manufacturer how the proper application of the right grade of vulcanized fibre will overcome serious production or sales difficulties.

Avail yourself of this service now . . . blue prints or a detailed description of the part and its functions will put us to work at once.

Write today!

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SHEETS : RODS : TUBES : SPECIAL SHAPES

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Offices in Principal Cities

Progress in Generator Design and Practice

Continued from page 68

10-per-cent reactors between the sections of a single ring bus. There is, of course, more of a hardship inflicted on the windings of the generator or generators nearest the fault, but the windings have sufficient thermal capacity to remain in operation under the circumstances for one minute with only approximately 30-deg. C. additional temperature rise in the copper.

The double-winding generator is applied to its best advantage on systems where the loads on the bus sections can be reasonably balanced, thereby keeping the two circuits of each unit loaded equally. Although it is possible to carry load on either winding without carrying any on the other, the transferring of power through a unit under such circumstances results in a reactive voltage drop of from 25 to 30 per cent in the 60-cycle case, and of approximately 15 per cent in the 25-cycle case. It should be noted that if it should be desired to carry more than half of the generator capacity on either winding, it would be necessary to increase the copper cross-section, and, in effect, build a generator of larger capacity.

From calculations made on various systems and from actual tests made in the factory, there is believed to be a very strong tendency on the part of the rotors of synchronized double-winding generators to remain in synchronism with each other under fault conditions. In fact, when a three-phase short circuit was made on one bus section of a ring bus provided with no reactors and connected to two model double-winding generators, each of which was carrying load, the strength between the windings connected to the non-short-circuited section proved to be sufficient to hold the units in step for approximately one second; the oscillographs show that first one unit and then the other tried to speed up, but could not do so on account of the strength of the tie. In similar tests, where more than two machines were used in a ring bus, the units never pulled out of step with each other on three-phase faults and the voltages on the non-short-circuited bus sections held up to approximately twice the corresponding voltages of a system being fed by the same number of single-winding units and having 10-per-cent reactors between the sections of a single ring bus.

Tests and studies of the double-winding generator have shown that, in addition to being able to transfer through the unit from one section to another and to generate in either winding almost irrespective of the load carried by the other winding, one can vary the voltage of either winding of the unit to a certain extent by varying the field current. In fact, it is even possible to produce a lower terminal voltage on an unloaded winding than on a loaded winding by under-exciting the field when the unit is tied into such a bus arrangement as is shown in Figure 9.

Motor Characteristics and Selection

Continued from page 58

codes, has resulted in a high degree of safety for the operator. The trend has been toward protecting the operator from any live or current carrying part of the motor or controller and toward convenient location of control, so that the operator does not have to reach across his machine or in any way expose himself to possible injury, while operating the control. The matter of convenient location of control has also helped to increase production by cutting down on waste time and effort.

It is generally recommended that every machine tool motor control should incorporate as a minimum, the following protections:

1—Overload protection
2—Low voltage protection
3—Enclosure of live parts
4—Disconnect protection

1—Overload protection limits the load that may be imposed upon the motor and machine. Most types of control include a time limit or thermal overload relay, either of which, permit overloads to be carried for short periods of time.

2—Low voltage or no voltage release protection prevents accidental starting of a machine tool when the voltage comes back on if the power fails at any time. This protects both the operator and his machine.

3—The enclosure of live parts is, of course, a protection for the operator, and also for the control itself, in that it practically eliminates the possibility of damage to the motor and control through flying chips or other foreign matter causing grounds or short circuits. In this connection it is well to mention that a machine tool motor will usually be equipped with partial enclosing covers and often totally enclosed, depending upon the hazards of the application.

4—The disconnect protection, preferably of the lockout type, is essential for inspection or repair of motors and also to render it safe for the operator to make adjustments or repairs on his machine.

Some of the advantages of direct drive for machine tools are as follows:

1—Elimination of line shaft losses when machine tool is idle
2—Speed adjustment can be readily obtained by field control, without stopping the work
3—Control may be provided for reversal of motor by means of push buttons or control handle, without the use of clutches
4—Acceleration of motor may be made automatic when desired
5—Dynamic braking may be provided for quick stopping
6—Spotting work is more easily accomplished
7—Machine tool location is independent of line shaft

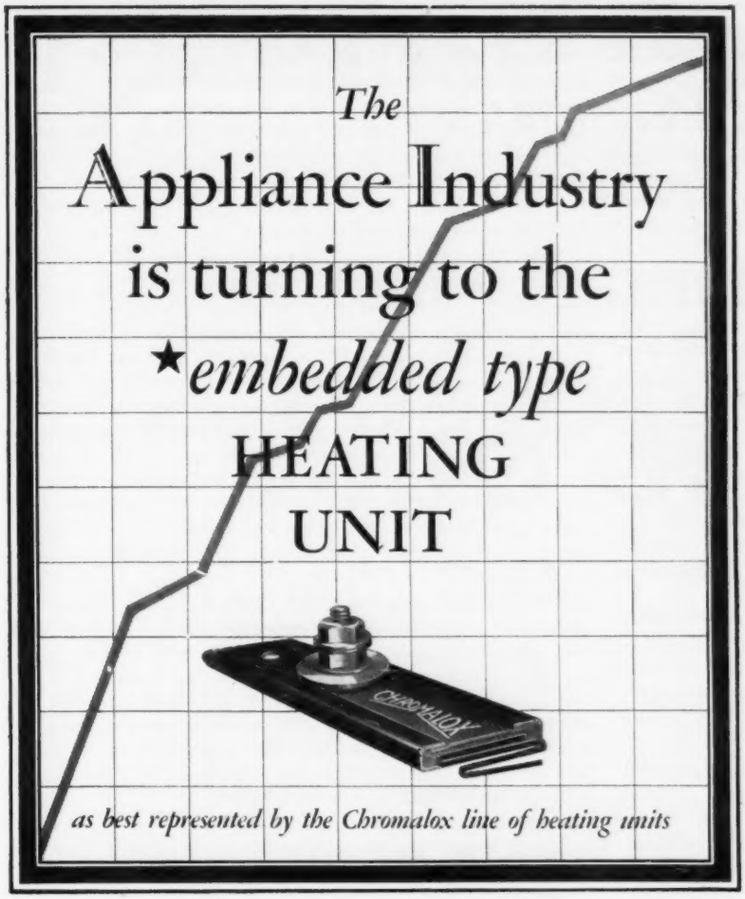
Figure 16, which was used to illustrate control features, shows a typical application of a shunt wound, adjustable speed motor to a drill press.

Spray Finishing Fundamentals

Continued from page 40

to one part lacquer or lacquer enamel. There is a new type of lacquer appearing on the market much heavier in body and made up especially for production shops.

Air Pressure and Volume—Air pressure (pounds per square inch) has a bearing on the obtaining of a satisfactory spray job. The supply of air volume (cubic feet of air per minute) available at a constant satisfactory pressure while the gun is in operation is the most essential and paramount feature to seek in the spray painting equipment purchased. Satisfactory pressure ranges between 20 and 55 lbs., depending on the material being sprayed, the requirements of the job and other conditions. There are occasions when higher pressures are necessary but these occur in the



This chart shows the trend of leading appliance and industrial equipment manufacturers towards adopting Chromalox embedded type heating units. Today, more than 90 electrical manufacturers are making their products trouble-free by standardizing on patented Chromalox heating units.

REASONS: Because, as manufacturers and dealers and central station commercial managers will tell you, Chromalox heating units have definitely helped to eliminate heating unit problems. Of patented construction (having the resistor wire embedded in refractory) these Chromalox units have enabled many an appliance manufacturer to finally put on the market products that are trouble-free as far as the heating element is concerned.

Chromalox-equipped, A Vital Selling Point

"Chromalox-equipped"—that in itself is a definite guarantee that such appliances will give your customers the best of performance service. That's why manufacturers such as Majestic Elec. Appliance Co., Wells Mfg. Co., Armstrong Elec. & Mfg. Corp., American Ironing Machine Co., play up the fact that they use Chromalox units. It's a convincing selling point. It means that you and your dealers won't be bothered with the usual kicks and comebacks that put you in wrong with customers, and eat into your profits.

Chromalox-equipped Products STAY SOLD

Most of the guess work about your product doing a real job can be easily eliminated by using Chromalox units. Automatically, kicks and come-backs are side-tracked when you use these trouble-free units.

But What About Your Products?

Whether you are working on a new product or improving an old one, we can be of valuable help to you with experience gained from years of working with leading companies making all kinds of electrically heated equipment. When you write for the Chromalox bulletins, tell us about the appliances or heating devices you want properly heated. There's no obligation!

Write for your copy of these 8-page bulletins showing dozens of sizes and ratings of the largest complete line of heating units for all kinds of electrical appliances, heating devices, hotel and restaurant equipment and other electrically heated products.

This thoroughly modern day-light factory now nearing completion, will be devoted to the manufacture of Chromalox heating units

★Chromalox
ELECTRIC HEATING UNITS

Manufactured Exclusively by Edwin L. Wiegand Company, 422 First Avenue, Pittsburgh, Pa.
SOLE LICENSEES: Canadian Chromalox Co., Ltd., Toronto, Can ABROAD: Geo Bray Co., Leeds, England

main when heavy materials are applied. There is a correct ratio of the three factors, air pressure, air volume and viscosity or weight of material being sprayed that must be observed if a commendable job is to be done.

Comparing the spray gun and the paint brush again, the air volume is controlled in the spray gun by the size of the air nozzle. As the air volume is increased more material can be properly atomized. The capacity of the paint brush to handle the material is increased as its width is increased in inches. This ratio is naturally limited to reasonable capacities.

Air pressure may be compared to the amount of rubbing-in that is done with the hand brush. The light weight, highly volatile materials such as light weight, color varnishes, shellacs, etc., require practically no rubbing-in when applied with the paint brush. These materials require low spraying pressures (20 to 30 lb.). Brushing lacquers and four-hour enamels may be included in this classification.

Ready-mixed paints and materials of similar weight require more energy to rub in when being applied with a paint brush. Likewise a higher air-pressure (from 30 to 45 lb.) is required when spraying. Commercial and industrial lacquers thinned to proper consistency in accordance with the manufacturer's instructions may be included in this class.

Materials more pasty in consistency, such as lead-and-oil, heavy tars, etc., call for still more strength in wielding the paint brush in rubbing the coating into the surface. Likewise a higher air pressure is needed at the spray gun. The new type lacquers mentioned could be included in this classification.

Classification of Spray Guns—The surface to be sprayed is a strong indicator of the type of gun required. Small pieces such as lighting fixture parts, builders' hardware, castings, machinery and objects of similar nature call for a cone or round spray like that shown in Fig. 1. Panels and flat surfaces of varying size, whether on an automobile body, a refrigerator panel, radio cabinet, etc., call for a fan type spray like that indicated in Fig. 2.

These types constitute the two general classifications of sprays, and are divided into different styles as follows:

The Cone Type Spray Gun was first used commercially. It lends itself to simplicity of construction and ease in cleaning. This type has only one air jet directed so as to both draw forth the material from the fluid tube and atomize it. This gun is obtainable in two distinct styles, namely: the overshot or simple design, and the needle control design. These guns may be obtained in air capacities of from 1 cu. ft. per minute upwards.

The Simple Design—This is very easy to clean because there is only the exposed fluid tube that stands just in front of the air nozzle, coming in contact with the material being sprayed. The air passing over the top of the fluid tube tip creates a vacuum and thus lifts the fluid up and out. The same air that does the lifting takes this fluid and breaks it up (atomizes it) and sprays it onto the surface. The volume of the fluid flow from this type of gun is gaged by raising or lowering the fluid tip standing directly in front of the air nozzle. The highest point of efficiency is obtained when one has the top of the fluid tip at parallel height to the center of the air orifice. The lower the fluid tip is screwed below this level, the less is the volume of fluid obtained. If the fluid tip is raised above this level, an undesirable spray is obtained.

This design is excellent for rough work, but certainly is not to be considered where speedy production is making its demands. Because of its simplicity of design, many cheap models of this kind have been made.

The Needle Control Design—The smaller sized members of this design of gun are usually employed in art work, decorating and polychroming, shading and toning of photographs, wax figures, glassware, lighting fixture parts, etc. The larger ones have the same function as described in the simple design gun. The spray pattern is more concentrated than that of the simple design, and is controlled by means of a needle that protrudes through the fluid tip, opening or closing the fluid orifice as the needle is moved back and forth. As will be noted, the fluid tip is so located that the air blast or jet completely encompasses it. Therefore, as the air blows past the fluid tip, it creates a vacuum, the fluid is sucked up, carried along and sprayed onto the surface in an atomized state.

Fan Type Spray Guns—These guns generally consume a greater volume of air than do the cone type spray guns. The lowest possible volume permissible to operate a fan type gun that will function satisfactorily is approximately 2 cu. ft. per minute. It is suggested that no lower air pressure than 20 lb. be considered at the spray gun nozzle for proper atomization of the coating materials being applied. The heavier the material, the greater the pressure must be for proper atomization and syphonage. Because the fan type gun is of newer design and is used in production line painting, it has had acclaim over the cone type. There are, however, many places where it is wasteful to use a fan spray, such as on spokes, narrow surfaces, rough castings, etc.

The fan type spray gun has three air jets. The center blast is to draw forth and atomize the material. The other two jets are smaller, located on each side of the center air jet and diametrically opposed to each other. Their function is to blow the spray into a fan-shaped pattern and further atomize the liquid. It is evident that great care must be exercised in having the alignment of these air jets perfect. Otherwise, a distorted or uneven spray pattern as shown in Fig. 7 would result.

It has become common, due to some production requirements, to supply the fan type spray gun so that a cone type spray may be obtained when needed. Either by manipulating or changing the air cap or turning some valve on the gun (depending on the individual manufacturer's design) the operator may obtain a cone spray on the majority of this style of guns offered.

Like the cone type spray gun, there are two general designs: the simple design having the same general attributes and regulation of spray volume as the cone spray of parallel design but using a bit more air (about 2 cu. ft. of air per minute). The occasion for the fan gun of this design is price. The spray pattern should be even in shape and about 4½ in. wide (from top to bottom) with a thickness of approximately one inch. The spray volume will not be so fast as the more expensive types of guns but its function is good if manufactured by capable hands.

The fan type gun of needle control design is more elaborate as compared to the other types and designs previously mentioned, in that the fluid needle moves back and forth in conjunction with the trigger. This insures a lack of spitting when the gun first starts to spray if the gun is fitted with a suction cup attached. If fluid is being fed to the gun either by gravity or pressure feed, this feature is necessary so as to stop the flow of material when not spraying. The needle moving back and forth in the fluid tip also insures a free fluid passage through the fluid tip. This design of gun is made in various air capacities from 3 cu. ft. upward to about 10 cu. ft. In high speed production jobs (where fluid is fed to the gun from a fluid pressure feed tank and the material being sprayed is heavy) there are guns designed to consume as high as 18 cu. ft. of air per minute.

Production shops seldom use a cup type spray gun. They usually feed the fluid to the spray gun either by gravity feed or from a pressure fluid tank, preferably the latter. In using this style of fluid feed, one must use a needle control type gun irrespective of whether it is a cone or fan spray.

HANDY & HARMAN
FOUNDED 1867
QUALITY SERVICE

Electrical Characteristics of

Handy Silver Solder

SILVER has the highest electrical conductivity of all metals. "Handy" Silver Solders embody this characteristic practically in proportion to their silver content, which ranges from 10% up to 80% for the 12 standard compositions.

"Handy" Silver Solders are accurately standardized and guaranteed. This fact gives their users *known resistance values* to work with.

Other important factors in the use of "Handy" Silver Solders are:

1 **Resistance to corrosion** from acids, alkalies or atmosphere.

2 **Great Strength.** Joints made with "Handy" Silver Solders have a tensile strength of 40,000 to 60,000 lbs. per square inch—usually greater than the parts joined.

3 **Ductility** and resistance to vibration and shock—important in airplane and automobile work. Also in certain radio connections—notably in the vibrating members of loud speakers.

4 **Melting Points.** "Handy" Silver Solders melt at lower temperatures than base metal hard solders, but resist working temperatures considerably above the melting point of soft solders. "Handy" Silver Solders melt at 1325° to 1600° F., depending upon the composition.

Metals They Join

"Handy" Silver Solders are applicable to soldering, brazing or welding iron, steel, bronze, brass, copper, nickel, nickel-silver and other metals or alloys fusing at 1400° or higher.

Often the Cheapest

"Handy" Solders flow so freely that they speed up production to a point where the labor-time they save and the regular perfection of results, make them economical to use.

Our **"Handy Book of Silver Solder E"** is full of useful hints to the electrical worker. Send for your copy.

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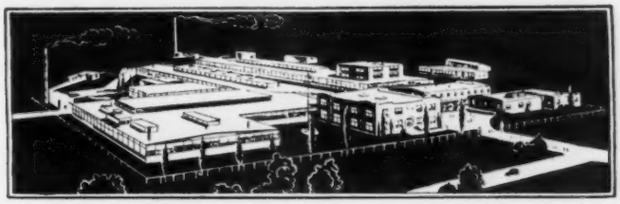

Bridgeport Conn.

Human Relations in Business

A discussion of the various activities of the American Management Association

Continued from page 34

as distinguished from the results of research or the value of research as such, the Association in 1926 organized its *Institute of Management*. This is a research group composed of the best minds in the field, who, through joint cooperative effort, may expect to achieve substantial results in furthering the scientific aspects of management and building up a body of sound knowledge with respect to techniques and cognate subjects.

Each member of the Association receives a copy of each of the papers prepared by this group. Typical subjects which have been discussed to date by the *Institute of Management* are: "Management Research Methods and Qualifications," "Present Status of Management Research Methods," "The Problem of Terminology in Management Research," "Essential Steps in a Business Management Research," "A Method of Determining Who Shall Participate Under a Managerial Profit-Sharing Plan," "Production Control of Research Projects."

F—In addition to the two annual conventions—and at times in connection with these meetings—each of the four specialized divisions of the Association holds conferences for the discussion of topics of special interest to themselves.

Further Association Activities

THE papers presented at these meetings are dealt with as are those from the general conventions, and printed copies in pamphlet form are sent to the individual and company members in whose field of special interest they lie as soon as possible after the conferences. The timeliness of these divisional discussions is assured by the particular delegation of the selection of topics and speakers to a vice-president of the Association and his advisory committee, each of whom has his particular field of interest in the division over which he has jurisdiction.

Among the popular publications resulting from the activities of these specialized divisions may be mentioned: for the financial executives, "Ratios—A New Method of Financial Statement Analysis," "Profits, Reserves and Consumer Purchasing Power," "Statements and Statistics as Working Tools of Effective Management." Marketing executives have found particular value in the publications on "Controlling Marketing Expenditures and Costs," "Budgeting Sales Expense and Sales Quotas," "Making the Retailer a Better Distributor of Your Goods," "Sales Supervisors' Part in Training." Titles in the office executives' division for which there has been a continued demand are: "Training Office Employees," "Extra Incentive Wage Plans for Office Employees," "Measuring Office Output," "Tests for Clerical Employees." In the production executives' division reorders have been frequent for "Control Points in Manufacturing Expenditures," "Forecasting the Manufacturing Program," "Foreman's Place in a Training Program," "A Purchasing Schedule That Abolished Storerooms."

The additional activities of the Association consist in:

G—Bibliographical service on management. This is available to all members on request.

H—Source material service. This is available to company members on request.

I—Information service covering any subject matter within the scope of the Association which the staff has at hand or can secure. This is available on request to company members.

J—Research service, available to company members covering special studies for individual companies involving wherever necessary the issuance of inquiries and conferences with companies that have something of special value to contribute.

K—Scientific investigations, which will be made on request for companies having ten or more representatives assigned to membership in the Association. Such investigations are thoroughly and completely made by the best authority available for the purpose. Each company member falling within this classification receives, moreover, one copy of each such investigation.

While neither the monthly nor the quarterly magazine may be subscribed to by non-members and the publication, *Business Conditions and Forecast*, is limited in circulation to the membership of the Association, the publications of the proceedings of the conventions and the conferences are usually made available for purchase by the general public about six months after their distribution to the members of the Association. The policy behind this practice is expressed by Mr. Ching:

"American management, or in fact any attempt at scientific management, presupposes that management in its broad sense is the coordination of all the sciences, plus the taking into consideration of human relationships and the realizing of mutuality of interest on the part of every person connected therewith."

American Management a New Term

THUS the American Management Association, for which the foundation was laid in 1913 by two little groups—one of about 60 persons interested in the operation of corporation schools, and the other of 25 Boston employment managers—has grown until as its president, Mr. Ching says:

"A new term has been used within the past decade, namely, American management. Every country outside of the United States is discussing American management."

The growth of the Association has run parallel with the growth of a new attitude among the big business men of this country. Of this expansion Mr. F. L. Sweetser, general manager of the Dutchess Manufacturing Company and a former president of the American Management Association, says:

"One astonishing outstanding development in our world of business is the new and surprising willingness of big business men to freely exchange ideas bearing upon the intimate methods and facts of their own concerns. Floundering alone through uncharted seas of experiment is no longer one of the necessities of management.

"The former practice of surrounding with secrecy the methods, practices, statistics, and other important features is no longer considered desirable. Think of the economic gain, the savings in time and money to America and to world-wide business. What an opportunity! Who can withhold cooperation?

"The American Management Association is truly a great clearing house for executives in every field. Through its research activities, meetings, addresses, discussions, correspondence, publication it offers unparalleled service.

MICA
to MICROMETER
MEASUREMENTS
We respect and work to a customer's plus and minus limits here at Macallen's.
Thicknesses are held exactly, holes are pierced and located according to specifications, profiles and forms are true to shape and to size.
And, the plate mica from which these parts are made is fabricated from materials of highly uniform quality.
Macallen mica parts conform exactly to specifications.
Our engineering service is offered for your aid at all times. Write without fear of obligation.
The MACALLEN COMPANY
BOSTON MASS.
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"Use Macallen Mica for all mica purposes" says MICAH.

Electrical Manufacturing News

A department containing news, and descriptions of new materials, parts and devices for the manufacture and repair of electrical products

Tariff Recommendations Follow Manufacturers' Brief

Recommendations originally included in the tariff brief prepared by the Tariff Committee of the National Electrical Manufacturers Association have been followed in general in the bill which was introduced by the Ways and Means Committee of the House on May 7.

The proposed changes in the electrical clauses of the present tariff law were made with a view to correcting certain inequalities. A new paragraph, designed to provide more adequately for electrical equipment and related articles, reads as follows:

"All articles suitable for producing, rectifying, modifying, controlling or distributing electrical energy; electrical telegraph, telephone, signaling, radio, welding, ignition, wiring, therapeutic and X-ray apparatus, instruments and devices, and articles having as an essential feature an electrical element or device, such as electric motors, fans, locomotives, portable tools, furnaces, heaters, ovens, ranges, washing machines, refrigerators and signs; all the foregoing and parts thereof, finished or unfinished, wholly or in chief value of metal and not specifically provided for, 40 per cent *ad valorem*."

Century Electric Company Buys Roth Brothers

Century Electric Company, 1806 Pine St., St. Louis, has purchased Roth Brothers & Company, Chicago, manufacturer of industrial power motors, generators for industrial power and lighting, current generators, motor generators for moving picture projectors, battery charging, signal systems, etc., and several specialties.

While Roth Brothers & Company will be operated as a separate division of Century Electric Company, some of the former's items will be manufactured in the Century plant in St. Louis.

Standardization of Gage Systems Is Great Need

The great need for standardization of gage systems, says the American Standards Association, is expressed in a letter received by the technical committee on wire and sheet metal gages from Professor Townsend of the Massachusetts Institute of Technology. Professor Townsend says, in part:

"An informal canvass of my associates indicates that almost any consolidating change in the existing gages would be far more desirable than the present state of affairs. They seem to feel that the expression of sheet and wire sizes by the decimal sizes, alone, would be the first logical step. After that overlapping sizes in the various systems (especially when the tolerances are considered) would be more or less automatically eliminated. . . .

"The general feeling among the electrical engineers is that it would be very desirable from their standpoint to have the wire in sizes which would give even units of circular mils. However, this idea has been mentioned as unimportant when compared to the major question of establishing a new and simple wire gaging system. Several suggestions have been made to this effect: One sheet metal gage such as the U. S. Standard, and one for wire such as the B & S or American gage."

Welsbach Company Creates New Market Set-up

Welsbach Company, Gloucester City, N. J., has announced plans for the creation of a new marketing structure which will embrace the company's refrigeration and heating and lighting divisions. Modern business methods are demanding that the manufacturer control his own wholesale distribution, says the company's statement, and with this in view Welsbach has already started and will shortly complete its new marketing set-up which is based on direct factory representatives selling and contacting the dealer outlets. Billing and accounting will hereafter all be done in the company's main office at Gloucester City. Spotted at strategic points, duplicating and exceeding the present branch office locations, are Welsbach sales offices and representatives of both the refrigeration and lighting and heating divisions. At certain points emergency warehouse stocks are carried.

Institute of Applied Lighting Opens in New York

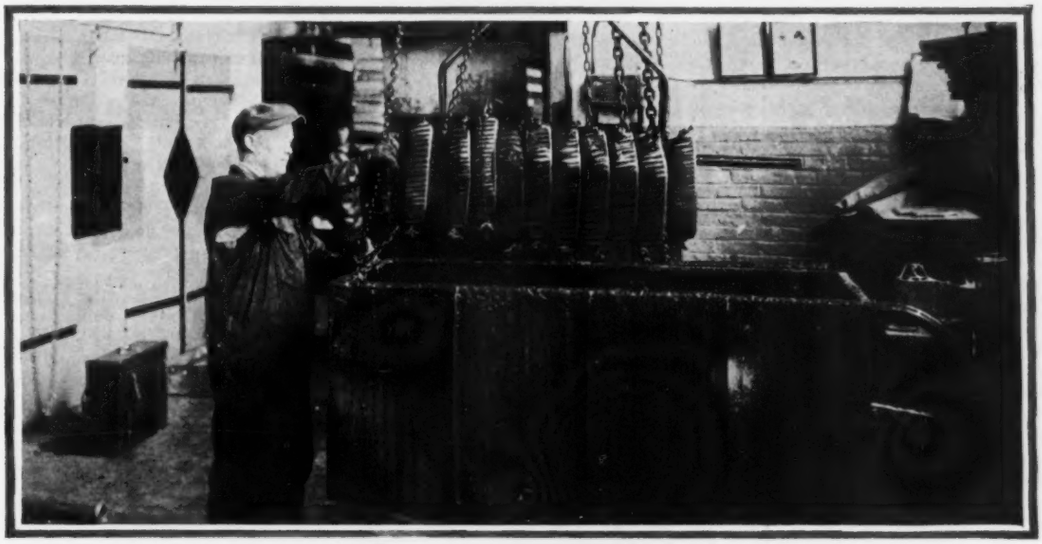
The application of electric light to all phases of life, commerce, and industry is completely depicted in the new Westinghouse Lighting Institute, Grand Central Palace, New York City. This permanent institute for the advancement of the art of modern lighting, sponsored by the Westinghouse Lamp Company, was officially opened the first of June. Ralph Neumuller, formerly associated with the United Electric Light & Power Company, New York City, has been chosen director of the institute.

Ralph Neumuller

The mark of differentiation of this institute of applied lighting from that of an ordinary exhibit is that it is a permanent institution that will be an ever-changing demonstration of modern practices of artificial illumination. Likewise, the changing

What the Better Dressed Street Will Wear

MAZDA AVENUE, an exhibit of the permanent Westinghouse Lighting Institute at Grand Central Palace, is a typical city street, 20 feet wide by 180 feet long. It depicts the "last word" in vari-colored signs, window displays, store fronts, and artistic lamps for street lighting as planned by Westinghouse Lamp Company engineers



Double-purpose varnish

A wall of varnish makes or mars your motors' service records. That varnish must be reliable for you expect it to do two things—thoroughly insulate and lastingly protect. ¶G-E varnishes were developed by General Electric to insulate and protect its motors. Clear or black, air-dried or baked, they afford a tough, durable film which effectively resists oil, moisture, and abrasion. ¶Anything less dependable than the best is false economy. Lower your maintenance cost curve with G-E insulating and protecting varnishes—and other G-E insulating materials.

PROMPT SERVICE

G-E insulating materials are sold only by G-E Merchandise Distributors, located throughout the country, who are equipped to give you prompt service. Get in touch with the G-E Merchandise Distributor near you or write to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

This catalog contains a complete listing of the following G-E insulating materials:

- Insulating and finishing varnishes
- Insulating oils
- Stickers
- Shellacs and paints
- Filling and sealing compounds
- Varnish-treated cloths and cloth tapes
- Flexible varnished tubing
- Insulating fibers and papers
- Motor tubing
- Asbestos and cotton tapes
- Friction and rubber tapes
- Prepared paper tapes
- Cords
- Twines

Send for your copy to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

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MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

conditions that may be observed as time progresses will be the result, not only of the work of the founders, but of the profession of lighting engineers throughout the country. It is a gigantic permanent experimental laboratory open to scientists, engineers, architects, designers, and all others of every branch of industry seeking the solution of lighting problems.

The institute itself, occupying as it does the entire seventh floor of the Grand Central Palace, an entire city block of 40,000 sq. ft., has brought into this operation the increments of modern construction. Mazda Avenue is a typical city street and has fronting on it a modern home, a bank, a theater, a combination gasoline filling station, accessory store and office, an industrial building, a department store, a florist shop, and two completely equipped electrical stores, one typifying the average central station merchandising room and the other representing an ideal example of an electrical store of average size.

Marcus N. Lothrop Elected Timken President

At a recent meeting of the board of directors of the Timken Roller Bearing Company, Canton, Ohio, Marcus N. Lothrop was elected president, succeeding H. H. Timken, who became chairman of the board. Other officers elected were W. R. Timken, J. G. Obermier, J. W. Spray, T. V. Buckwalter and H. J. Porter, vice-presidents, and J. F. Strough, secretary-treasurer.

M. N. Lothrop

Mr. Lothrop joined the Timken Company in 1911, as metallurgist, and for the past eighteen years has been intimately connected with its affairs, being closely associated with H. H. Timken. During that time he has occupied various capacities successively, in metallurgy, research, in charge of operations, and, for the last few years as vice-president and general manager in charge of all operations and sales.

Liberty Gauge & Instrument Company Purchased by Proctor & Schwartz

Proctor & Schwartz Electric Company, with headquarters in Cleveland, Ohio, and factories in Philadelphia and Cleveland, announced that it has purchased the business of the Liberty Gauge & Instrument Company, in the latter city, maker of Liberty automatic irons, hot plates, etc., and will merge all Liberty products in the new line of Proctor safety automatic electrical appliances.

Proctor & Schwartz Electric Company is owned and operated by Proctor & Schwartz, Inc., Philadelphia, manufacturer of commercial drying machinery. This company has for any years been engaged in the development of automatic heat-controlled devices, and holds numerous patents covering, among others, the thermostatic control of electric heat. The new Proctor line will embody this exclusive heat-control method, which is reported to be positive, simple, efficient, and an entirely new development over existing thermostatic heat regulators. The Proctor line will include iron, toaster, waffle iron and other appliances, to be announced in the near future.

Menlo Park Treasure

THE ORIGINAL GALVANOMETER used by Edison in his early experimentations is to be restored to its former position at the Dearborn museum of original Edison apparatus. E. R. Scales, Edison Lamp Works, is shown presenting the instrument to Henry Ford, sponsor of the museum

Brevities

Acme Electric Heating Company, manufacturer of electric heating appliances for industrial, mechanical and domestic use, 1217 Washington St., Boston, Mass., has moved its New York office from 28 Warren St. to 135 Liberty St.

Air-Way Electric Appliance Corporation, Toledo, Ohio, announces the removal of its New York City office from 455 Seventh Ave. to newer and larger quarters at 205 E. 42nd St.

Alexander Milburn Company, Baltimore, Md., announces that E. P. Boyer was elected vice-president at a recent meeting of stockholders. He has been associated with the company since 1919 and has been a district manager and sales agent.

Allen-Bradley Company, Milwaukee, announces that Panfilo Trombetta, formerly in charge of development and design in the industrial control department of the General Electric Company, has been appointed manager of the Allen-Bradley control research department. He is a graduate of Ohio State University and for five years was associated with the late Dr. Charles P. Steinmetz in consulting engineering.

American Blower Corporation, Detroit, Mich., has created a separate division to handle the sale of small ventilating units. Under the name of the Aero-Pel Corporation, offices have been established at 601 West Washington Boulevard, Chicago, with Frank B. Ruoff as general manager.

American Brown Boveri Corporation, New York City, has organized a new subsidiary to be known as American Brown Boveri Company, Inc. The latter will handle all Brown Boveri electrical and mechanical operation, exclusive of shipbuilding. American Brown Boveri Company, Inc., owns the entire capital stock of the Condit Electrical Manufacturing Corporation, Boston, Mass., which will continue to manufacture and sell its products, electrical control and protective equipment through its own organization.

Appleton Electric Company, 1701-29 Wellington Ave., Chicago, has purchased from the Jefferson Electric Company, Chicago, the complete Powerlet line, including threadless and threaded conduit fittings, as well as the complete line of Powerlet entrance fittings, and everything pertaining to these lines.

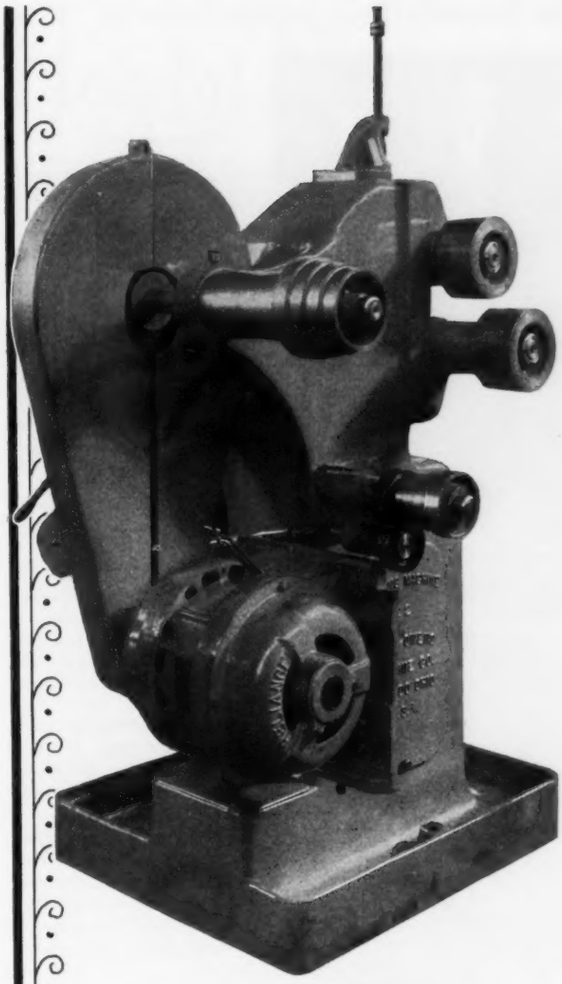
B-L Electric Manufacturing Company, 1832 Washington Ave., St. Louis, is the name of the newly organized division of the Benwood-Linze Company, St. Louis, radio distributor and rectifier manufacturer, which will handle the rectifier portion of the business.

Baker & Company, Inc., Murray and Austin Sts., Newark, N. J., has purchased the good will, machinery and equipment of the R. & H. Platinum Works, New York City and Perth Amboy, N. J., and will continue the operation of this business under the name of Baker & Company, Inc.

Becker Brothers Electrical Corporation, Chicago, manufacturer of carbon for electrical purposes, has added an additional building to the Ashland Avenue carbon plant, and has finished the installation of machinery and furnaces which will almost double the former capacity.

Chicago Utilities Corporation, operated by Neil C. Hurley and J. F. Roche, has purchased and taken over active management of the newly organized Binks Manufacturing Company, making a complete line of paint spraying equipment and spray cooling systems. Mr. Hurley, president of the new company, was formerly president and chairman of the board of the Hurley Machine Company, and is prominent as one of the pioneers in the washing machine industry. J. F. Roche, executive vice-president and treasurer of the new company, was formerly manager of the Montana Power Company, vice-president of the Apex Electric Distributing Company, and assistant to the president of the Edison Electric Appliance Company.

Colormatic Light, Inc., is a new organization of illuminating engineers, specializing in the adaptation of mobile color lighting to decorative art and elec-



New Departure Equipped

Reliance Motor shown, mounted on Kent-Owens No. 2 Power Feed Miller, is New Departure-equipped. Stock motors may be mounted on vertical bed-plate without change of end bells when ball bearings are used.

Six Money-Making Advantages of New Departure-Equipped Electric Motors

1. They need lubrication but once a year.
2. They will cut maintenance expense in half.
3. They are superior for high as well as low speeds.
4. They are extremely clean and compact.
5. They eliminate most burnout causes.
6. They never need adjusting or readjusting.

Further advantages and *proof* of economy are pointed out in two booklets which we will gladly send on request. Ask for "Booklet K" and "Cutting Your Costs."

New Departure Ball Bearings

The New Departure Manufacturing Co.
Bristol, Connecticut
Chicago • Detroit • San Francisco

1083

trical advertising. The organization is developing an automatic dimmer which is designed to create the effect of a continuous blend of approximately one hundred and fifty spectrum shades. The mechanism will be applied to signs, window displays, interior decorating, theatres and building illumination.

Consolidated Instruments Company of America, 305 E. 47th St., New York City, reports that its recently acquired subsidiary, Molded Insulation Company, Mount Vernon, N. Y., will shortly begin erection of a new plant in the latter city which will triple its manufacturing capacity. The new addition will be completed and in operation by July 1.

Edison Electric Appliance Company, Chicago, has announced the following changes in San Francisco and Northwest sales organization: J. J. Burns, heretofore in charge of sales at San Francisco and Oakland, will now devote his time to special work at the company's headquarters in San Francisco; C. E. Allen, formerly service station manager, will have charge of the sales territory south of San Francisco, formerly covered by Mr. Burns; M. S. Gray succeeds Mr. Allen as service manager; C. J. Anderson, formerly handling only commercial cooking equipment in the Northwest, has been transferred from Seattle to Portland where he will add apartment house ranges to his line; R. P. Segurson, who formerly handled apartment house ranges in the Northwest, has added commercial equipment to his line, which he will now handle in the Seattle district only.

Ender Manufacturing Company, maker of show window lighting equipment, daylight desk lamps and reflectors, has moved from 92 Lafayette St., to larger quarters at 213-217 Grand St., New York City.

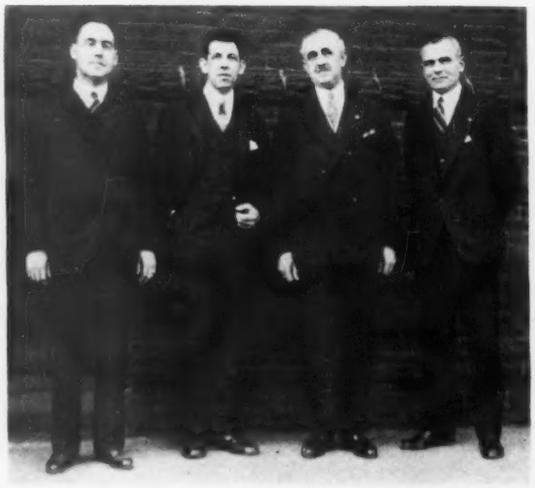
Federal Steel Products Company, Newark, N. J., has engaged E. S. Bolton, 1210 E. 113th St., Cleveland, Ohio, as selling representative in Ohio for the company's line of safety switches, panelboards and steel cabinets.

Forsyth Electric Company, formerly located at 2905 Estelle Pl., Seattle, Wash., has moved to larger quarters at 1107 E. Pike St., Seattle, where it continues its motor, generator, air compressor and fitting business.

Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago, manufacturer of welding equipment and supplies, has appointed F. O. Weber, 229 Boulevard Des Allies, Pittsburgh, Pa., as sales manager for the Pittsburgh district. The company, together with its parent concern, Chicago Steel & Wire Company, has announced plans for the construction of new general offices, adding over 80,000 sq. ft. to the space now occupied.

Garfield Manufacturing Company, Garfield, N. J., manufacturer of cold molded products, announces that Adolph Meister, vice-president of the company, has sailed on an extended tour of Europe, where he will study at close quarters, conditions in the cold molded industry, particularly in Germany and Switzerland.

Experts Plan Atlantic City's Jubilee Lighting



*ATLANTIC CITY'S commemoration of the 50th anniversary of the invention of the incandescent lamp was planned by city and civic officials, aided by three distinguished electrical **engineers** and lighting experts. The group shown at the left, left to right, is: A. L. Powell, Edison Lamp Works; S. G. Hibben, Westinghouse Lamp Works; Mayor Anthony M. Ruffu, Jr.; and A. F. Dickerson, General Electric Co.*

General Electric Company, refrigeration department, Cleveland, has appointed H. J. Jenkins as apartment house specialist. He was formerly with the distributing firm of R. Cooper, Jr., Chicago.

General Electric Company has named as manager of the company's Philadelphia works, Neil Currie, Jr., managing director of the Pittsfield Works motor department. He is a graduate of the University of Minnesota, and has been associated with General Electric since 1908. Robert V. Good, section superintendent at the Schenectady works, has been appointed assistant to the manager at Philadelphia.

Grinnell Washing Machine Corporation, Grinnell, Iowa, has been reorganized under the laws of Delaware, capitalization, $400,000. Charles G. Adsit has been elected president, and I. N. Merritt, vice-president and general manager.

Holmes Products, Inc. has appointed C. J. Abbott, works manager at the company's Bridgeport, Conn. plant. He was formerly assistant works manager of the Pontiac plant of the Oakland Motor Car Company.

Ideal Commutator Dresser Company, Sycamore, Ill., has removed its Eastern offices and warehouse to 18 Warren St., New York City, where larger quarters will make it possible to carry a larger quantity of Ideal products.

Indian Motorcycle Company, Springfield, Mass., will start regular production on the new Indian refrigerator on July 1, according to Louis J. Bauer, president. The company will offer the refrigerating unit only, leaving the choice of cabinet to the distributor. Production plans call for 5000 units this year, sales of which will be confined to Springfield, Boston, New York, Chicago and Detroit.

Liberty Electric Company has moved from 211 S. McCrea St. to 34 W. North St., Indianapolis, Ind.

Lighting & Specialty Company is the successor to the firm of Gottschall & Westcott, factory representative, 2205 Leonard St., Dallas, Tex.

Modern Equipment Company, Muskegon, Mich., has purchased the assets of the O. E. Szekely Corporation, Holland, Mich., and will continue to make the latter's line of portable pumps and generating sets at the Muskegon plant.

Pittsburgh Reflector Company has moved its New York office from 145 W. 41st St. to General Motors Building, Broadway and Fifty-seventh St., New York City.

Polymet Manufacturing Corporation, New York City, has purchased the Strand & Sweet Manufacturing Corporation, Winsted, Conn., maker of fine copper wires. A constant supply of magnet wire is now provided from the Poly-Coils, and the surplus will be sold to manufacturers in the radio and electrical industries.

Sangamo Electric Company, Springfield, Ill., has completed arrangements with the Hamilton Watch Company, Lancaster, Pa., for the formation of a new firm to be known as the Hamilton-Sangamo Corporation, which will market a joint product of the two companies, under the name of Hamilton-Sangamo electrically wound clocks. The board of directors of the new firm will be made up of equal representation from the two companies, Donald S. Funk, Robert C. Lanphier and Fred C. Holtz, having been named for Sangamo, and Robert E. Miller, Calvin M. Kendig and Carl W. Drepperd for Hamilton.

Sparklets, Inc., 19 W. 44th St., New York City, has appointed Frederick Haase divisional sales manager, to supervise all sales and merchandising activities in New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia and West Virginia. He was formerly associated with the Frank E. Wolcott Manufacturing Company, Hartford, Conn., as vice-president in charge of sales.

Square D Company, Detroit, Mich., announces that G. F. Kelly has been appointed advertising manager. He was formerly head of the motor department of the Strong, Carlisle and Hammond Company, Cleveland. Previously he had been a member of the Western Electric

Helpful Facts *about electrical insulation*

Empire Oiled Insulations: Super-Micanite, and Micanite bonded mica insulation. Mico Insulating Varnishes, Compounds, Cements, Friction and Rubber Tapes are some of the products of the Mica Insulator Company.

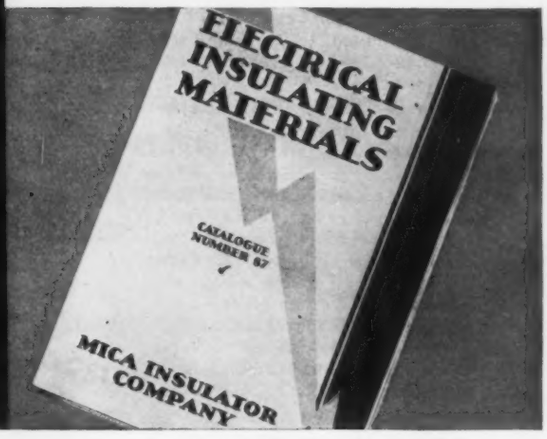
40 pages of useful data for the electrical manufacturer and repairman

Tables of physical and electrical characteristics amplified by suggested applications for the seventy and more electrical insulations are contained in this new catalog.

It is a handbook that will prove extremely useful to the electrical industry. Copies are now ready for distribution. Write and tell us how many copies you can use.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Works: Schenectady, N. Y. London, England
Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal



PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

sales organization and vice-president and sales manager of the Duquesne Electric Manufacturing Company, Pittsburgh.

Taplet Manufacturing Company, 3915 Powelton Ave., Philadelphia, has moved its New York office from 71 Murray St. to 25 West Broadway. The change in location was necessitated as a result of the increased Taplet business in the metropolitan district. The office is still under the supervision of R. J. Milford, district sales manager, assisted by H. E. MacIndoe.

Triad Manufacturing Company is the name of an organization of radio tube manufacturers and engineers recently established at Pawtucket, R. I., for the manufacture of a complete line of radio tubes, including all popular types and television and photo-electric cells. The officers are: president, George Coby; vice-president and sales manager, H. H. Steinle; treasurer, Ely Egnatoff; secretary, William Cepek.

Trico Fuse Manufacturing Company, Milwaukee, Wis., has moved its New York division sales office from 154 Nassau St. to 41 Park Row, New York City.

Trumbull Electric Manufacturing Company, Plainville, Conn., has appointed A. H. Bergendahl manager of the Trumbull New York City office, following the resignation of George Flading. G. U. Van Cleaf, for the past three years field specialist, will take over Mr. Bergendahl's old Cleveland-Columbus-Pittsburgh territory.

Union Metal Manufacturing Company, Canton, Ohio, has opened the following new district offices: Southeastern District office, in charge of C. A. Williams, 1508 Chandler Building, Atlanta, Ga.; Southwestern District office in charge of L. Mitchell, 728 Allen Building, Dallas, Tex.; Boston office managed by E. H. Bradley, 378 Stuart St., Boston, Mass.

Wagner Electric Corporation, St. Louis, has appointed L. G. Tandberg, branch manager of the Wagner Los Angeles sales office.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., announces that its offices are now located in the Grant building. The sales offices occupy the entire eighteenth floor and the offices of the chairman of the board, the Westingouse Lamp Company and the Westinghouse Electric Elevator Company occupy half of the nineteenth floor. The central district office of the Westinghouse Company in Pittsburgh covers territory in the states of West Virginia, Michigan, Ohio, Indiana, Kentucky, and Pennsylvania.

Manufacturers' Catalogs

Johns-Manville Corporation, New York City. Twenty-four page illustrated circular, entitled, "Celite for Concrete." Celite was recently added to the Johns-Manville line.

Mercoid Corporation, 564 W. Adams St., Chicago. Catalog No. 15, complete automatic controls for domestic and industrial heating equipment.

Rome Wire Company, Rome, N. Y. An interesting folder describing precision coils made by Rome Wire Company, division of General Cable Corporation. The folder describes the processes by which the coils are wound, the materials used and the outstanding features of this company's line of precision coils.

Sutton Engineering Company, Park Building, Pittsburgh, Pa. Specifications and illustrations of a full line of straightening machinery.

H. O. Swoboda, 3400 Forbes St., Oakland Station, Pittsburgh, Pa. Bulletin No. 160, "Falcon" electrically heated large asphaltum coating tanks.

Westinghouse Electric & Manufacturing Company, E. Pittsburgh, Pa. Leaflet No. 1101-D, D. C. mill motors; leaflet 20401, mechanical turbine drives; catalog 224, panel boards; reprints of an article entitled, "A History of the Development of the Single-Phase System."

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Avenue, New York City.

"Burrows" Therapeutic Lamp.
"L. R. Co." Receptacles.
"Williams" Commutator Dressing.
"Splendida" Electric Iron.
"Graustark" Line of Lighting Fixtures.
"Sal Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Pioneer" House Pump.
"Blaisdell" Automatic Electric Cigar Lighter.
"Columbus-Universal" Electric Vacuum Cleaner and Floor Polisher.
"Defiance" Cigarette Lighter.
"Hillcrest" Line of Lighting Fixtures.
"Vesodore" Cigar Lighter.
Manufacturers of Electric Incinerators.
Manufacturers of Electric-driven lampshade lacing machines.

Coming Conventions

American Institute of Electrical Engineers.—Regional meeting at Swampscott, Mass., June 24-29.

American Society of Mechanical Engineers.—Regional meeting at Salt Lake City, Utah, July 1-4. Third national meeting of the Iron and Steel Division during the Steel Treaters' Convention, Cleveland, Ohio, Sept. 11-13.

American Society for Testing Materials.—Annual meeting at the Chalfonte-Haddon Hall, Atlantic City, N. J., June 24-28.

Association of Iron and Steel Electrical Engineers. — Annual meeting at William Penn Hotel, Pittsburgh, Pa., June 17-21.

American Refractories Institute. —Annual meeting at the Keystone Athletic Club, Pittsburgh, Pa., June 25.

Fourth International Management Congress. — Paris, France, June 19-23.

New Goods for Your Inspection

Filter Condensers

Dubilier Condenser Corp., 346 Madison Ave., New York, has placed on the market Type 688 filter condenser in 1 and 2

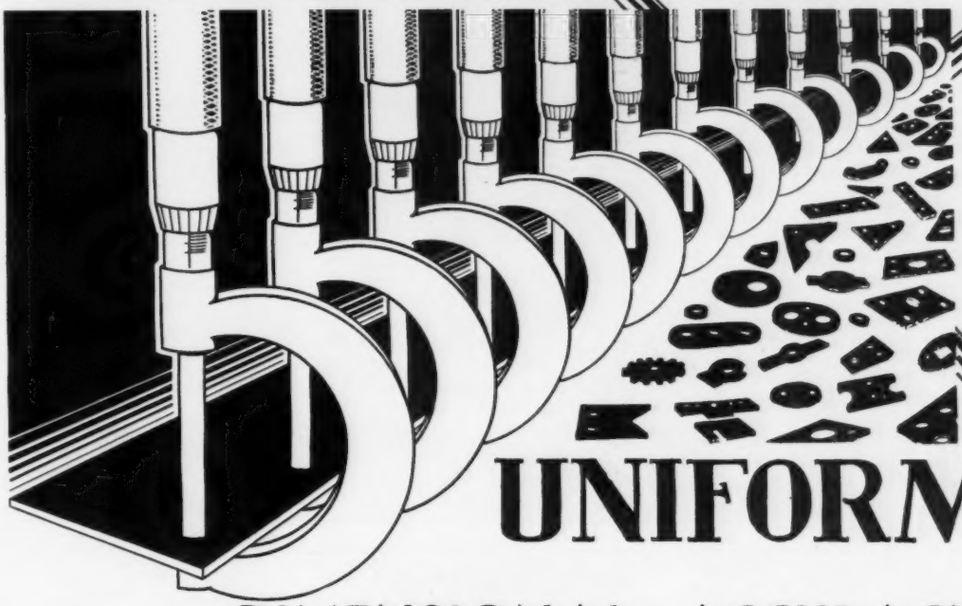
mfd. capacities. This condenser is rated at 2000 volts D. C., and 1500 volts A. C., as the working voltage in each case. These ratings are said to be conservative as the actual breakdown voltage is between 6 and 9 times the rated voltages. Each condenser is housed in a heavy metal case with porcelain insulated terminals at the top. These condensers may be employed in any filter circuit where voltages up to 2000 are encountered, such as in amateur transmitters and broadcast transmitters using ¼ kilowatt tubes.

Molding Compound

Celluloid Corp., 58 West 40th St., New York, announces Lumarith, a cellulose acetate molding material designed to have the desired characteristics of toughness, extreme plasticity and the ability to obtain infinite color effects and ease of mechanical operation in production. This molding material is supplied in the form of slabs, chips or powder, but sheet, rods and tubes are also available and may be used successfully for veneering plain colored molded articles. This material has a tensile strength of 2500 to 5000 lbs. per sq. in., and a dielectric strength of 60 cycles and 450 to 700 volts per mil. This material can be molded with steam pressure up to 175 lbs. (375° F.). The use of lower temperature simply requires longer cycles.

SYNTHANE

Laminated Bakelite



UNIFORM

DIMENSIONAL ACCURACY

4 Pts. +

1 Punching Quality.....
2 High Dielectric Strength
3 Low Water Absorption
4 Low Surface Leakage...
+ UNIFORMITY THROUGHOUT

IN Sheets . . . dimensional accuracy gives you stampings to close tolerances . . . allows you to figure costs more accurately . . . to design tools for the production of more accurate parts . . . to make punch press stamped engravings.

In Specialties . . . dimensional accuracy and strict adherence to blueprints speeds and facilitates assembly in your plant . . . . . .

Synthane Is Uniformly Accurate In Dimensions.

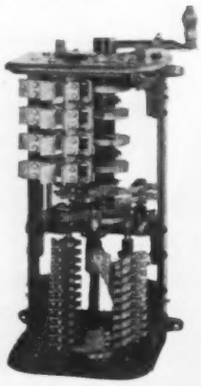
TEST IT YOURSELF

SYNTHANE CORPORATION OAKS · PENNA

Sheets, Rods, Tubes, Fabricated Parts

New York, Chicago, Cleveland

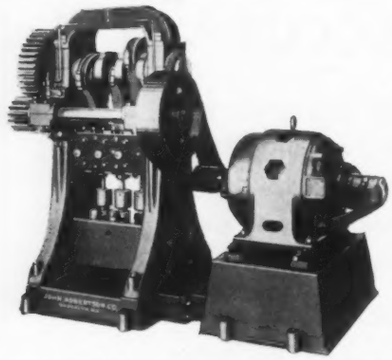
D. C. Cam Switch



General Electric Company, Schenectady, N. Y., has placed on the market a D. C. cam switch designated as CR-3108, which has been developed for the control of blowers, pumps, etc. The switch can also be used for similar non-reversing applications where the current inrush or starting torque is not severe or the operations are not frequent. This switch is available in two forms. Both are for non-reversing service with armature regulation over five points, while one form has field regulation over 22 points. The intermittent armature capacity is 1000 amp., while the same capacity, continuous rating, is 500 amp. The switches are rated at 550 volts, maximum.

High Pressure Hydraulic Pump

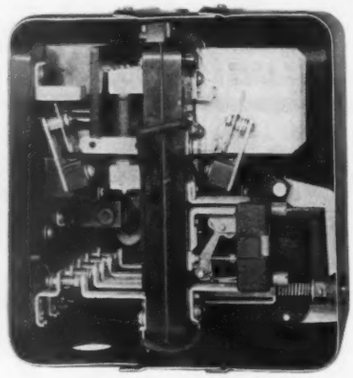
John Robertson Co., 12 Water, Brooklyn, N. Y., has brought out a high pressure hydraulic pump for use with lead extrusion presses used by rubber hose manufacturers and electrical wire and cable manufacturers. This pump is furnished in sizes up to 50 gallons per minute and for working pressures up to 6500 lb. per square inch. The pump has a steel shaft with large diameter eccentric



bearings which are bronze lined throughout. The main bearings are babbitt lined and the eccentric and main bearings are lubricated automatically from a 2½ gallon oil reservoir. The plungers are of non-rust steel and operate in a forged steel pump chamber, bronze bushed and fitted with removable bronze valve seats. Each pump is equipped with a hydraulic safety relief valve with sufficient capacity to relieve full discharge of the pump without a substantial increase in pressure.

Motor Control Switch

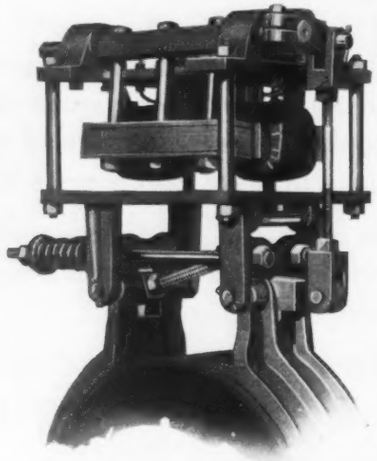
General Electric Company, Schenectady, N. Y., announces a switch, CR-7006-F-1, designed to take the place of the magnetic switch, motor circuit switch and inclosed fuses usually required in controlling the operation of a motor. This switch can be applied to control any motor where a general-purpose magnetic switch would be used. The switch consists of three sections: a back portion containing a motor circuit switch, a middle portion containing a base on the front of which the magnetic switch is mounted and on the back of which clips are provided for fuses, and the front cover. Spare mechanisms may be installed in the switch, using only a screw-



driver. A guard for the incoming line terminal prevents accidental contact when the operator is substituting spare mechanisms or inspecting the switch. Overload protection is provided by two temperature overload relays so designed that they trip the contact mechanism just before the overload will cause the motor to be excessively heated. The switch is furnished with a holding interlock which permits its use with a "start-stop" momentary-contact, push-button station.

Mainco A. C. Elevator Brake

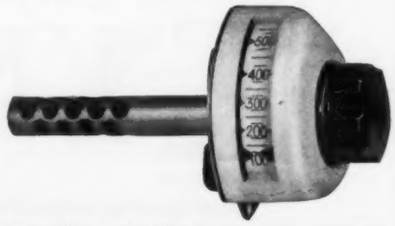
Maintenance Co., 449 West 42 St., New York, announces Type PA-3 Mainco A. C. elevator brake. The brakes used



are of cast iron, well reinforced and provided with high-grade lining. They are opened and held open by an electromagnet operating through a toggle and closed by helical springs. The operating mechanism of the brake is at the top where there is generally more room available. It is supported by the shoes, so that no separate base or mounting is required, and it is so designed that the magnet and armature hang naturally in the oil reservoir and are removable (with the top) without disturbing the reservoir.

Indicating Thermostat

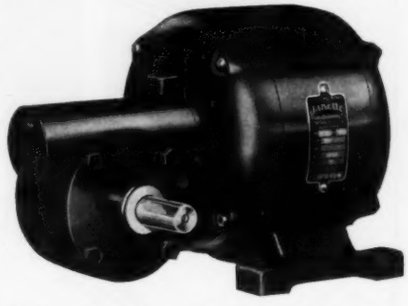
Hart Mfg. Co., Hartford, Conn., has placed on the market the Diamond "H" indicating thermostat designed for use in



controlling electric range oven temperatures. This device not only regulates the heat but indicates at all times the actual oven temperature. It is thermostat and thermometer at the same time. Because of its small design it takes up little space on the side of the oven and can be used on any size oven. A short thermal unit is used and the thermostat can, therefore, be placed anywhere in the oven.

Motor-Driven Speed Reducer

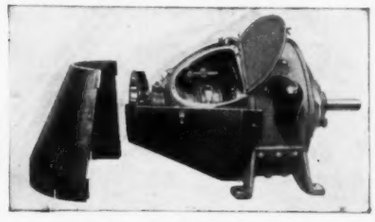
Janette Mfg. Co., 556 W. Monroe St., Chicago, announces a motor-driven speed reducer, available with motors ranging in capacities from 1/30 to ¼ hp., and with speed reductions from 20 to 1 to 50 to 1.



The unit consists of a worm and gear reduction unit inclosed in a cast iron housing which is bolted to the motor frame. Gear ratios of 20, 26, 32, 34, 38, 40, 44, and 50 to 1 are available. The motor is available in D. C., split-phase, or repulsion-induction A. C.

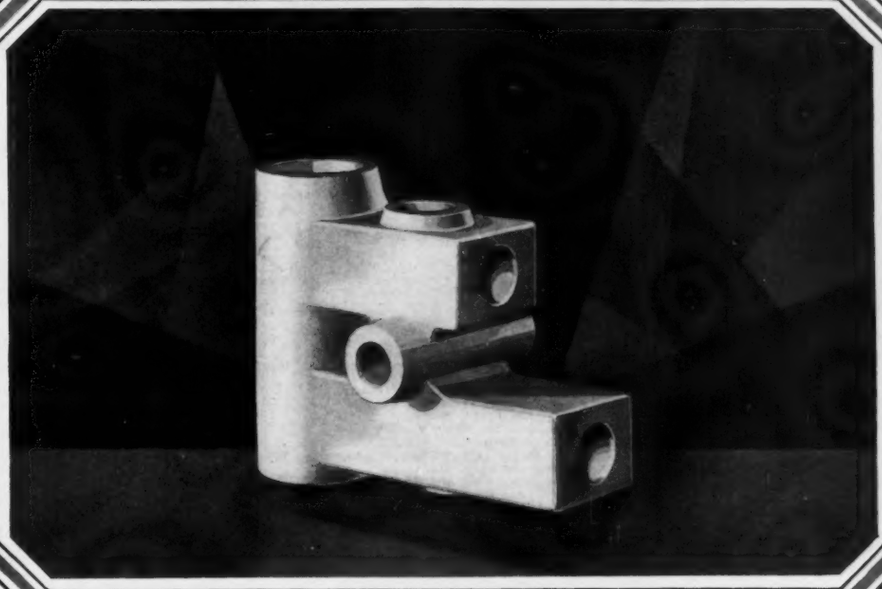
Fan Cooled Motor

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., announces a fan cooled Type SK totally inclosed motor for direct current applications. All mechanical parts except the shaft are interchangeable with those used on the present totally inclosed



motor of the same frame size. This motor is applicable to coal handling equipment, paint shops, foundries, and other places where the air is dirt laden. The essential mounting dimensions are the same as the standard open motor of the same type.

Evidence of Approval



The steadily growing demand for Newton Die Castings is convincing evidence of the approval which Newton Standards of Quality have earned. In automotive accessories, electrical appliances, office equipment, portable tools, and other specialty fields, Newton Die Castings are proving themselves dependable and economical. Nothing can take the place of Quality consistently maintained.

THE NEWTON DIE CASTING CORPORATION

146 MUNSON ST. NEWTON NEW HAVEN NEW HAVEN. CONN.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore. This Classified Index has been an exclusive ELECTRICAL RECORD feature for over thirty-six years.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Magnets. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
Mow. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa.
Deceleco, Inc., Wayne, Mich.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines)
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.

American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dunco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 312 E. 29th, Chicago, Ill.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton,
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Newcroll Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Selb Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., Dept. G, New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.
BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Agar Mfg. Corp., Whippany, N. J.
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Rockford Fibre Container Co., Rockford, Ill.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
American Nickeloid Co., Peru, Ind.
Anaconda. See American Brass Co.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.), Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)

BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo. ..... H . .
B. B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. ..... H . .
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. ..... C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. ..... C . . . . . .
Bozill-Bruel Carbon Co., Columbia Park, O. C . . . . H . .
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C . . . . . .

The Aluminum Painted interior of Building No. 30, the River Works of the General Electric Company, West Lynn, Mass. Note the excellent light distribution throughout this room.

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BRUSHES, Commutator—Continued
Carbon Engrg. Co., Slinger, Wis. ..... C L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. ..... C .. ..
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y. ..... C .. ..
Carenco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. ..... C W S .. L
Columbia Machine Wks., & M. L. Co., 263 Chestnut, Brooklyn, N. Y. .... H ..
Cooley Mfg. Co., 98 Park Place, New York .. W .. .. ..
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City ....
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. .... H .
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. ....
Eureka Copper Products Corp., North East, Pa. .... W S H .
Fleck Carbon Co., 808 Broome, New York C .. ..
General Electric Co., Schenectady, N. Y. .... C .. .. H .
Graphalloy. See Graphite Metalizing Corp.
Graphite Metalizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C .. .. H ..
Henrite Products Co., 98 Park Place, New York, N. Y. ..... C .. ..
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio .... H ..
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C .. ..
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C .. ..
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C .. ..
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C .. ..
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C .. ..
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C .. ..
National Carbon Co., Cleveland, O. ..... C .. ..
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. .... .. W .. .. ..
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C .. ..
Pure Carbon Co., Wellsville, N. Y. ..... C W S .. L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. .... W L
Salem Electrical Supply Co., Salem, Mass. .. W .. .. ..
Seabury, Ralph L., Factories Bldg., Toledo, O. C .. ..
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C .. ..
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C .. ..
Stackpole Carbon Co., St. Mary's, Pa. .... C .. ..
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y. ..... C .. ..
U. S. Graphite Co., Saginaw, Mich. ..... C .. ..
Universal. See Graphite Metalizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.

BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain

Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elecl. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineallac Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH. See Cloth, Untreated.

CABINETS, Fibre

Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcawood. See Continental-Diamond Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.
American Metal Wks., 4868 Stanton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Aurora Steel Products Co., Aurora, Ill.

Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berkes Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., North Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isart Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 406 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
Machillien Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezioh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 83rd St., Cleveland, O.
Buckeye Mfg. Co., Springfield, O.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Conrades Mfg. Co., 1942 N. Second, St. Louis, Mo.
Corlieth Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Dekker Co., Geo., Henderson, Ky.
Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Edlein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Gulbransen Co., Kedzie & Sawyer, Chicago, Ill.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y

Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., 914 S. Michigan Ave., Chicago, Ill.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stradivara Co., Coshocton, Ohio.
Stettner Phonograph Corp., 318 E. 75th, New York.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 306 Broadway, New York, N. Y
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
West Box Co., 235 Liberty, Springfield, Mass
Wood Cabinet Corp., 196 Lexington Ave., New York, N. Y.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N.Y
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Becker Bros. Elecl. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.

CASEIN PLASTICS. See Molded Insulation.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.
Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y
Dick Bros., Inc., Reading, Pa.
Eureka Copper Products Corp., North East, Pa.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Quality Aluminum Casting Co., Waukesha, Wis.
Tensal. See National Bronze & Aluminum Foundry Co.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eureka Copper Products Corp., North East, Pa.
Faries Mfg. Co., Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Harsch, John, Bronze & Foundry Co., 11612 Madison Ave., Cleveland, O.
McGill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.

Measuring Instruments and Methods —by Braymer

The sixth of a series of informative articles on the subject, by an authority, page 50

Die cast radiator cap. Stewart also die casts a variety of ornaments, hub caps, and other fittings, as well as working parts.

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Fittings Die Cast by Stewart

Radiator caps, hub caps, and similar die cast details add tangible sales value as well as artistic finish to the modern motor car.

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Advance Tool & Die Casting Co.
1654-60 Holton St., Milwaukee, Wis.
Edgewood 284

CASTINGS—Continued
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co.

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh
Aluminum Industries, Inc., 2438 Beekman, Cincinnati, O.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 156 East Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 557 W. Congress, Chicago, Ill.
Krome-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 291 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven, Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Permite. See Aluminum Industries, Inc.
Soss Mfg. Co., Roselle, N. J.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 182 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eastern Malleable Iron Co., Naugatuck, Conn.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Forest City-Walworth Run Fuondries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach. Foundry Co., North Wales, Pa.
Products Machine Co., Bridgeport, Conn.
Sacks Iron Foundry, L., 257 Wilson Ave., Newark, N. J.
Snead & Co., Pine St., Jersey City, N. J.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Procian. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Anchorlute. See Technical Products Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixkwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1255 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Pisa Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Anchorlute. See Technical Products Co.
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa
Thermold. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 22 E. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass.

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Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serwell Sales Corp., 1740 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

J. & H. Elec. Co., 161 Clifford, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Bendit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hitaco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Induceto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Manle Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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CIRCUIT TESTERS. See Testers, Fuse and Circuit
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros. Co., Piano, Ill.
CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.
CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.
CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated

Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth).

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) ..... See B
Silk ..... See S

Acme Wire Co., New Haven, Conn.	C	S	P	.	.
Armco. See Rogers Paper Mfg. Co.					
Armatite. See Mica Insulator Co.					
Brand & Co., William, 268 4th Ave., New York			P	.	.
Campbellite. See National Vulcanized Fibre Co.					
Carboloid Products Corp., 15 Park Row, New York, N. Y.	C	.	P	.	.
Case Brothers, Inc., Highland, Park, Conn.	.	.	P	.	B
Case Mfg. Co., Unionville, Conn.	.	.	P	.	.
Case & Risley Press Paper Co., Oneco, Conn.	.	.	.	.	.
Celoron Co., Bridgeport, Pa.	.	.	P	F	B
C-F. See National Vulcanized Fibre Co.					
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.	C	.	.	.	.
Continental-Diamond Fibre Co., Bridgeport, Pa.	.	.	P	.	.
De Jonge & Co., Louis, 69 Duane, New York, N. Y. (Condenser)	.	.	P	.	.
Dexstar. See Dexter & Sons.					
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)					
Dielectric Mfg. Co., St. Louis, Mo.	C	S	P	.	B
Electrite. See West Virginia Pulp & Paper Co.					
Fyberoid. See Wilmington Fibre Specialty Co.					
General Electric Co., Section I-483, Merchandise Dept., Bridgeport, Conn.	C	.	P	.	.
Hartford City Paper Co., Hartford City, Ind. (Glazaine Condenser Tissue).					
Hewitt & Bros., C. B., 16 Perry, New York	C	.	P	.	.
Hi-Tex. See Stevens Paper Mills.					
Incella. See Tarentum Paper Mills Co.					
Irvington Varnish & Insulator Co., Irvington, N. J.	C	S	P	.	.
Manning Paper Co., J. A., Troy, N. Y.	.	.	.	.	B
Mica Insulator Co., 200 Varick, New York	C	S	P	.	B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.			P	.	.
National Vulcanized Fibre Co., Wilmington, Del.				F	.
New Jersey Wood Finishing Co., Woodbridge, N. J.	C	.	.	.	.
Ohmoid. See Wilmington Fibre Specialty Co.					
Old Hick. See Hewitt & Bros., C. B.					
Peerless. See National Vulcanized Fibre Co.					
Rogers Fibre Co., 210 Lincoln, Boston, Mass.	.	.	.	F	.
Rogers Paper Mfg. Co., South Manchester, Conn.	.	.	.	.	B
Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)					
Scutan Co., 342 Madison Ave., New York	.	.	P	.	.
Sico. See Standard Insulation Co.					
Standard Insulation Co., East Rutherford, N. J.	C	S	P	.	.
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varnished Hard Fireboard)	.	.	.	.	B
Sterlite. See Sterling Fireboard Co.					
Stevens Paper Mills, Windsor, Conn.	.	.	.	.	B
Tarentum Paper Mills Co., Tarentum, Pa.	.	.	P	.	.
Turbonite. See Brand & Co., Wm.					
Union Mills Paper Mfg. Co., New Hope, Pa.	.	.	P	.	.
Warren Mfg. Co., 342 Madison Ave., New York, N. Y.			P	.	.
West Virginia Pulp & Paper Co., 230 Park Ave., New York	.	.	.	.	B
Wilmington Fibre Specialty Co., Wilmington, Del.			P	.	.

CLUTCHES, Magnetic

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.

COIL (Coils),

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.

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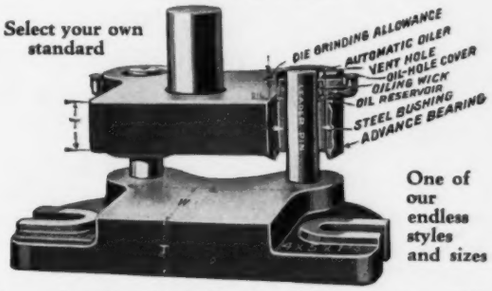

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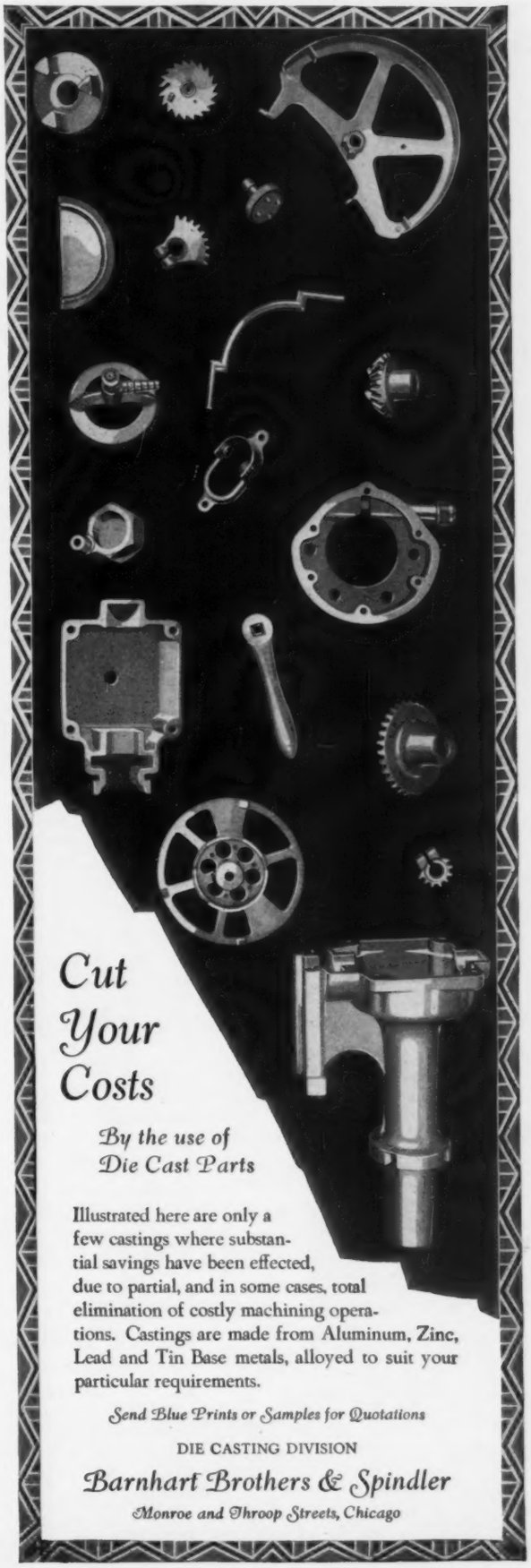

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COILS—Continued
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Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature
Winders, Armature & Field Coil. See Winding Machines Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire

COILS, Finished
Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Coto Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland O
Electrical Coil Winding Co., 2735 Saunders, Camden.
Electrical Products Mfg. Co., Providence, R. I.
Fredericks Co., H. M., Lock Haven, Pa.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 226 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 599 Broadway, New York, N. Y.
Robertson-Davis Co., 361 W Superior, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y
Rome Wire Co. (Div of General Cable Corp.), Rome, N. Y
Sevison Magneto Engrg. Co., 397 Phillips, Toledo, O.
Stuns & Barron, 210 E Pratt, Baltimore, Md.
Toledo Standard Commutator Co., 2242 Smead Ave., Toledo, O.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Derby Commutator Co., Derby, Conn.
Electric Materials Co., North East, Pa.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.
COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Brush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riopelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper

CONNECTORS, Pin-Plug
Kliegl Bros. Universal Electric Stage Ltg. Co., 321 W. 50th, New York, N. Y.

CONNECTORS, Wire
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill. (Solderless-Tapeless).
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 53 W. Jackson Blvd., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-G Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston, Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elecl. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
F. C. & M. Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd. Chicago, Ill.
Resisto. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Unelco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.
COPPER. See Brass, Bronze and Copper; also Castings
COPPER TUBING. See Tubing, Brass and Copper
CORD TIPS. See Tips, Cord.
CORD, Tinsel. See Tinsel Cord & Thread.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y
Vitreosil. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.
COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lips, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 325 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.
COVERING MACHINES, WIRE. See Wire Manufacturing Machines

CUPS, Grease
Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
Lunkenheimer Co., Cincinnati, Ohio.

CUPS, Oil
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 40 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.
CURRENT INDICATORS. See Instruments, Packet.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., 120 S. La Salle, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled
Whittier Co., Horace R., Pequabuck, Conn.
DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.

DIE SETS
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Mareck & Nebel, 255 Greenwich, New York, N. Y.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y
Lamination Stamping Co., 764 Windsor, Hartford, Conn.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.
DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady.
EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS
American Neon Light & Sign Corp., 625 Sixth Ave., New York, N. Y.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Manhattan Elecl. Supply Co., 190 Sixth Ave., New York.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
(Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis, & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
Schwenke Machine Engraving Co., 2038 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati.
Wright Radio Co., 114 Exchange, Rockland, Mass.

EYELETS
Platt Bros. & Co., Waterbury, Conn.
Waterbury Brass Goods Co., Waterbury, Conn.
Waterbury Button Co., 835 S. Main, Waterbury, Conn.
FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.

FEET, Felt
Brawley, T. R., 279 20th, Brooklyn, N. Y.

FELT
Advance Felt & Cutting Co., 609 W. Lake, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 38, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Chicago.
Sexton Mfg. Corp., 59 E. Madison, Chicago, Ill.
FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof; Sheet, Rod, Tubes.
Armite. See Spaulding Fibre Co.

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FIBRE, Phenol—Continued
Bakelite-Dilecto. See Continental Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized

Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Continental-Diamond Fibre Co.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibre Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp

Cohn, Sigmund, 44 Gold, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., Newark, N. J.
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Vacuum Tube Products, Steneck Trust Bldg., Hoboken, N. J.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting

Ideal Commutator Dresser Co., 1008 Park, Sycamore, Ill.
Martindale Electric Co., 1255 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See H
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B
American Ring Co., Waterbury, Conn. (Candle.) ..... S
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... S
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. ..... H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. ..... B
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York ..... B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B
Braun, J. G., 600 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I H
Cambridge Brass Co., Cambridge, Mass. ..... B
Chase Brass & Copper Co., Waterbury, Conn. B S
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. ..... B I
Cleaneasy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B S
Crescent Brass Mfg. Co., Reading, Pa. ..... B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) I
Dunlap Co., John, Carnegie, Pa. ..... S
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. ..... S
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. ..... B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. I
Fralick Co., S. R., 15 S. Clinton, Chicago. I
Franklin Brass Foundry Co., Reading, Pa. ..... B
Friedley-Voshardt Co., Chicago. ..... B
Grabler Mfg. Co., 9505 Broadway, S. E., Cleveland, O. I
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Spindles).

Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... S
Incandescent Supply Co., 465 West Broadway, New York, N. Y. ..... B H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I
Liberty Machine Co., Wauwatosa, Wis. ..... B I
Light Metal Stamping Co., 310 13th St., West New York, N. J. ..... S
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. ..... H
L. & W. Brass Wks., 361 W. Superior, Chicago, Ill. ..... B
Madeilte. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. I
Metal Products Co., 210 Canal, New York ..... B
Metro Iron Ornament Co., 191 Christie, New York, N. Y. I
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. I
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. ..... B
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. ..... S
Monarch. See Perfectite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 565 Broadway, New York, N. Y. ..... B
Noblok. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. I
Onli. See Perfectite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. ..... B S
Perfectite Co., 1457 E. 40th, Cleveland. ..... S
Pittsburgh Valve & Fittings Co., Barberton, O. I
Plume & Atwood Mfg. Co., Waterbury, Conn. B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Yoster Sons, Alfred.
Products Machine Co., Bridgeport, Conn. ..... B
Reading Brass Co., 141 Schiller, Reading, Pa. B I
Ribaysen Mfg. Co., J., 952 W. Lake, Chicago, Ill. B
Rodale Mfg. Co., 200 Hudson, New York. ..... B H
Sandow Tool Co., 1440 Bway, New York, N. Y. ..... S
Scovill Mfg. Co., Waterbury, Conn. ..... B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S
Standard Metal Spinning Co., 123 Mott, New York, N. Y. ..... B
Star. See Perfectite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. I
Steele & Johnston Mfg. Co., Waterbury, Conn. B S
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. I
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B
Walden Tool & Metal Mfg. Co., New Haven Conn. ..... B
Wameco. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. ..... B
Waterbury Metal Wares Co., Waterbury, Conn. ..... S
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. ..... B S
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. ..... B

FLASHERS, Sign

Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.

Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 230 Guttenberg, San Francisco, Cal.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.

Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.

FLEXIBLE SHAFT MACHINES

(For shafting. See Tubing, Flexible Metallic.)
Strand & Co., N. A., 5001 N. Lincoln, Chicago, Ill.

FORGINGS, Non-Ferrous

Scovill affg. Co., Waterbury, Conn.

FORMS, Coil Winding

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire

Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
City Wire Frame Co., 2025 S. Michigan Ave., Chicago.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 398 First Ave., New York.
Murray Hill Wire Frame Co., 214 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... P
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... P N
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. ..... P
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
Chase-Shawmut Co., Newburyport, Mass. ..... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C N R
Cote Bros. Mfg. Co., 182 W. Lake, Chicago ..... C P R
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C R
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va. ..... C P N R
Elliott Electric Co., Shreveport, La. C
Gem. See Chicago-Jefferson Fuse & Electric
General Elec. Co., Section W-234 Merchandise Dept., Bridgeport, Conn. ..... C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... C R
H. & H. See Hart & Hegeman.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... P R
Hudson Wire Co., Ossining, N. Y. ..... O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. ..... C P N O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, .025 to 2 Amp.) ..... C N R
Monarch Fuse Co., Jamestown, N. Y. ..... C N R
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. ..... C P R
Platt Bros. & Co., Waterbury, Conn. ..... O
Powell, P. W., 119 W. Ohio, Pittsburgh. ..... P R
Ree-Nu-It Elec. Co., New Bedford, Mass. ..... C P R
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C R
Royal Elec. Co., Chelsea Station, Boston. ..... P N
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-In-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P R
Trico Fuse Mfg. Co., 1061 McKinley Ave., Milwaukee ..... C P N R
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Hexium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.

Yes—
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PLASTIC molding is like custom tailoring. The customer gets a made-to-measure job—but that doesn't insure his satisfaction.

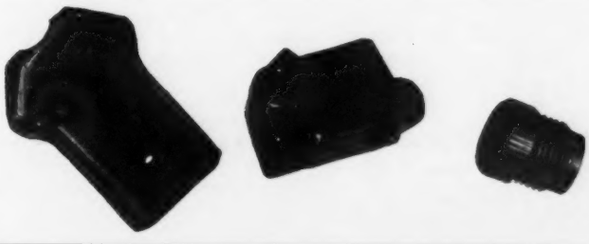
Your best guarantee that your moldings will have nothing queer about them is your selection of the right molding plant.

In International molding service you get the benefit of an experience that covers an immense variety of work. An experience running back almost to the beginning of molding itself.

You get the benefit of the best methods, developed, tested and proved throughout this most extensive experience.

You get the benefit of the best molding facilities. Your work done by a large, efficiently managed plant, with the best modern equipment, constantly running at full capacity. A plant serving leading manufacturers in many industries.

Certify your own moldings by choosing a thoroughly dependable service.



International molding service is complete. Making your molds, producing all metal inserts, the assembling and molding—all handled on one order and meeting your delivery schedule. Estimates gladly made for you without obligation.

PRECISION MOLDERS OF BAKELITE AND SHELLAC COMPOSITION

INTERNATIONAL INSULATING CORPORATION

Division of The General Industries Co.

ESTABLISHED 1875 ELYRIA, OHIO

1907

GASKETS, Rubber
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)
Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vielcan, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Wks. of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm
Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition
Chicago Stock Gear Wks., 105 S. Jefferson, Chicago, Ill.
Celoron Co., Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1890 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel
Earle Gear & Machine Co., Wayne Junction, Philadelphia
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide
Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators

GLASS BULBS. See Bulbs, Glass.

GLASS CANDLES. See Candles, Fixture.

GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes
Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE
Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vandervoer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Beryllite. See Plaut & Co., L.
Bostock, Rhodes & Co., 11 N. Moore, New York, N. Y.
Carnia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Chesler & Sons Co., J., 45 Varick Ave., Brooklyn, N. Y.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletleco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kaufold Glass & Ceramic Co., Star City, W. Va.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
Luminite. See Macbeth-Evans Glass Co.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Mellilite. See Gillinder & Sons, Inc.

Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearltone. See Inland Glass Co.
Peralan. See Gillinder & Sons, Inc.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasco. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestepal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Soloman & Son, Inc., L., 199 Wooster, New York, N. Y.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells
Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

GRAPHITE BEARINGS. See Bearings, Oil-less.

GRID LEAKS. See Radio Circuit Components.

GRIDS, Resistance. See Units, Rods and Grids.

GRILL CLOTH. See Cloth, Untreated.

GRINDERS, Commutator. See Tools, Commutator Truing.

GROMMETS. See Eyelets.

GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.

GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons
Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neverille, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg, New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.

HOT WIRE METERS. See Instruments, Portable and Switchboard.

IMPREGNATING COMPOUNDS. See Wax and Compounds

IMPREGNATING, VACUUM. See Ovens, Industrial.

INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.

INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation
Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill

INDUCTION COILS. See Coils, Finished.

INSTRUMENT, Jewels. See Jewels.

INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.

INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Riddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Grand Central Terminal Bldg., New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy, See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia Pa
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Radio Elec'l Wks., 50 W. 22nd, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 230 Broadway, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Simplex. See Leeds & Northrup Co.
Strobatchy. See Radio Elec'l Wks.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Unipivot. See Rawson Elec'l Inst. Co.
Weeland Apparatus Co., 140 Cedar, New York, N. Y (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave Newark, N. J.

INSTRUMENTS, Pocket
Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 230 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard
This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and faultfinders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., Penacook, N. H.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Mfg. Co., 986 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Pure Elecl. Mfg. Co., 5235 Wabash Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Ground-Ohmer. See Stieht & Co.
Hamilton-Sangamo Corp., Springfield, Ill.
Handy. See Weinberg & Co.
Hickok Elecl Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Weiford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Queen. See Gray Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 230 Broadway, New York, N. Y.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Stieht Co., H. H.
States Co., Hartford, Conn.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Stieht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Stieht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint, Varnish, Laquer.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.

INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., 115 Brown, Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.

INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.

INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Continental-Diamond Fibre Co., Bridgeport, Pa.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu See Stanley, Arthur F.
Macallen Co., Boston 27, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.

IRONS, Soldering. See Soldering Irons.

JACKS, Armature. See Lifts, Armature.

JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.

"Good Enough" is not good enough here

MOULDING that is not the result of carefully planned production is apt to be hurriedly turned out, insufficiently finished, and perhaps not entirely suited to the desired use.

Moulding of that sort never has had a place in Scranton Button. Starting with the moulds, Scranton precision, uniformity and finish are scrupulously carried through to the completed casting. Our long experience in moulding for all industries will be helpful to you in solving your production problems. And the Scranton plants, largest and most newly equipped in the world, will save you the maximum time compatible with fine moulding in Bakelite, Lacanite, and Phenolic, as you require.

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Plants at SCRANTON, PA., *and* AUBURN, N. Y.

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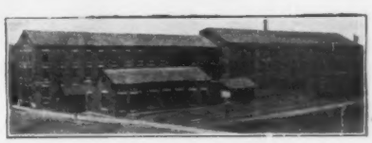
SCRANTON MOULDS

retained by us are always repaired, insured and renewed, if necessary, without additional expense to the customer unless otherwise agreed.

Main offices and plant, Scranton, Pa.



Auburn Plant, Auburn, New York

JARS, Battery Glass—Continued
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Universal. See Oeffinger, J. L.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.

JOINTS, Fixture Insulating

Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Boston 27, Mass.
Bandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White Co., O. C., 15 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer Metal. See Paint, Varnish and Lacquer.

LAMINATIONS. See Discs, Armature.

LAMP BASES. See Bases, Reading Lamp.

LAMP BULBS (Unfinished). See Bulbs, Glass.

LAMP FILAMENTS. See Filaments, Incandescent Lamp.

LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.

LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES

(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD

American Lead Co., 3112 Penn Ave., Pittsburgh, Pa.
Blatchford Co., E. W., 608 Dearborn, Chicago, Ill.
Columbia Smelting & Refining Wks., 365 West, New York, N. Y.
DuBois & Co., Frederick N., 152 Riverside Ave., Newark, N. J.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago, Ill.
Federated Metals Corp., Woolworth Bldg., New York, N. Y.
Jacobson & Son Co., I. M., 15304 Idaho, Detroit, Mich.
National Lead Co., 111 Broadway, New York, N. Y.
Raymond Lead Co., 735 S. Washtenam Ave., Chicago, Ill.
Turner Lead Co., East St. Louis, Ill.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.

LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES

Sign Letter, Flashlight, Projector and Reflector Lenses. Also glass caps, jewels and bezels for all electrical devices. See also Jewels, Instrument Bearing.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products Co., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)
Stromberg-Carlson Telephone Mfg. Co., 1050 University Ave., Rochester, N. Y.

LETTERS, Sign

Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 6700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill.

Manhattan Elecl. Supply Co., 190 Sixth Ave., New York, N. Y. (For Gas Signs.)
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature

Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

LININGS, Socket

Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.

LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

LOUD SPEAKERS

Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Amervox. See American Reproducer Co.
American Reproducers Co., 1204 Summit Ave., Jersey City, N. J.
A. R. C. See American Reproducers Co.
Amplion. See Wolff, J. W. & W. L.
Balsa Wood Co., 158 Pioneer, Brooklyn, N. Y.
Baritone Mfg. Co., 846 Jackson Blvd., Chicago, Ill.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4659 Stanton Ave., Philadelphia, Pa.
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Dreher & Son, Chas., 157 Spring, New York, N. Y.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 12nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Enaco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutsi Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Fillford, Kalamazoo Mich.
Kyle. See Newcombe-Hawley.
Lata Balsa. See Balsa Wood Co.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Corp., 33 W. 21, New York, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products, 219 W. Chicago Ave., Chicago, Ill.
Newcombe-Hawley Lab. of United Reproducers Corp., St Charles, Ill.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powerola. See Temple Corp.
Puronower. See Platter Cabinet Co.
Quam Radio Corp., 9703 Cottage Grove Ave., Chicago, Ill.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Temple Corp., 5253 W. 65th, Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
Ultratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.
United Radio Corp., 25 Leighton Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Wondrphone. See Universal High-Power Telephone Co.
Wolff, J. W. & W. L., 133 W. 21st, New York, N. Y.
Wright-De Coster, Inc., St. Paul, Minn.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper

Anderson Mfg. Co., Albert & J. M., 289 A St., Boston Mass.
Dante Elecl. Mfg. Co., Bantam, Conn.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

	KEY
Luminous Compound	See C
Pendants (Bulbs)	See P
Standard Parts	See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y. ... P
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ... S P
Bryant Electric Co., Bridgeport, Conn. ... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ... S
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. ... P
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn. ... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Electric Co., Hartford, Conn. ... S P
Hubbell, Inc., Harvey, Bridgeport, Conn. ... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3533 Forbes, Pittsburgh, Pa. ... C ... P
Reynolds Spring Co., Jackson, Mich. ... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y. ... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia ... P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. ... C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Eisler Electric Corp., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines

MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.

MAGNET CHARGERS. See Chargers, Magnet.

MAGNET STEEL. See Steel, Magnet.

MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.

MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.

MAGNETIC CHUCKS. See Chucks, Magnetic.

MAGNETIC CLUTCHES. See Clutches, Magnetic.

MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent

Bullens Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chica.
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.

MALLETS, Raw Hide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Crude Pelt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.

MANGANESE, Battery. See Chemicals, Battery.

MEASURING INSTRUMENTS. See Instruments.

METAL CUTTING OUTFITS. See Welding and Cutting

MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.

MEGOHMMETERS. See Instruments, Laboratory Standard

MERCURY SWITCHES. See Switches, Mercury.

METAL CLEANERS (Compound). See Cleaners, Metal

METAL FINISHING. See Plating & Finishing.

METAL MARKING OUTFITS. See Engraving Machines

METALLIC SHADES. See Shades, Metallic.

METERS. See Instruments.

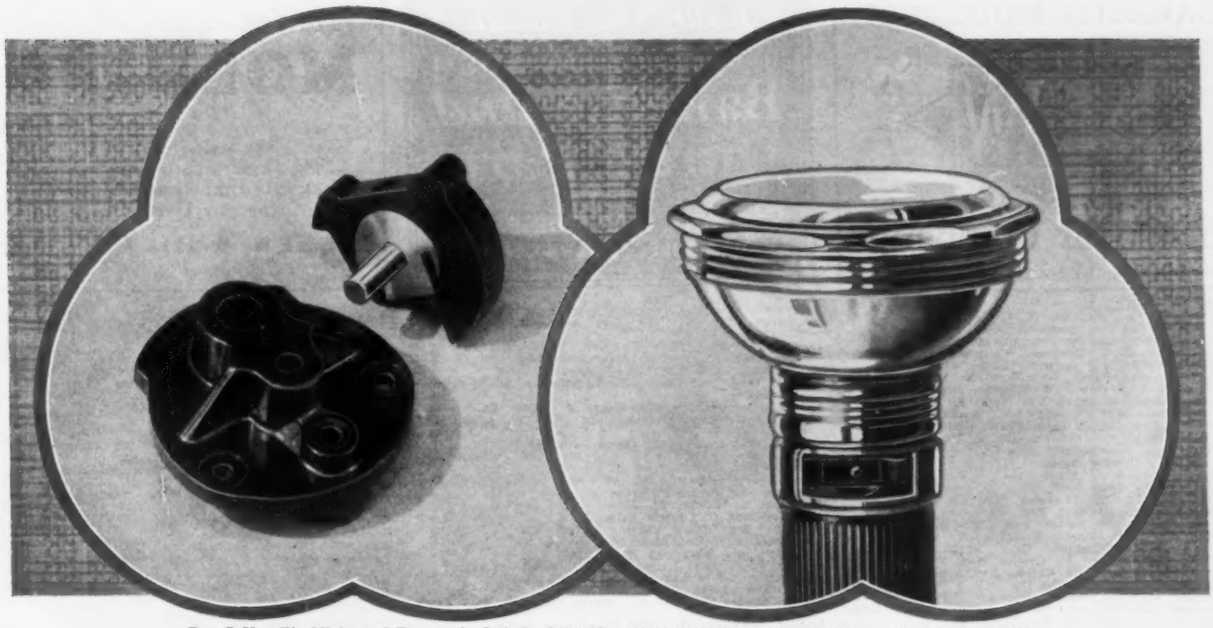
MICA SHADES. See Shades, Mica.

MICA TAPE. See Tape, Mica.

MICA UNDERCUTTERS. See Slotting Machines & Tools Commutator.

N. E. M. A.

Turn to page 25 to read about what took place at the Hot Springs National Electrical Manufacturers Convention last month.



Ray-O-Vac Flashlight and Rotomatic Switch of Bakelite Molded. Made by French Battery Co., Madison, Wis.

Rotomatic Switch on Ray-O-Vac Flashlight made possible by *Bakelite Molded*

MANY users of flashlights have experienced the inconvenience of a dead battery from short circuits and from switches which failed to provide positive "make and break." To overcome the most frequent causes of current leakage and dead batteries, the French Battery Company designed the Rotomatic switch. Economical production of the switch was made possible through the use of Bakelite Molded.

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Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Variek, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pratt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

MOLDED INSULATION

Alco. See American Insulator Corp.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Amerine. See American Insulator Corp.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Brewlite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celluloid Corp., 58 W. 40th, New York, N. Y.
Celoron Co. Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Everco. See Bakelite Corp.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 60 Walck Rd., N. Tonowanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago
Impreco. See Insulation Products Co.

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Insulation Products Co., Richland, Pittsburgh, Pa.
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International Insulating Corp., Hyrria, O.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Mico. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
Molded Insulation Co., Mt. Vernon, N. Y.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 188 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norloc. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Solitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynolditte. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starlite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

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International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.

MOTOR PLATFORM BASES. See Bases, Motor Platform.

MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS

Alternating Current	See S
Direct Current	See S
Motors, 1 Hp. up	See M
Motors Fractional Hp.	See F
Universal	See U

Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S . .
Allis-Chalmers Mfg. Co., Milwaukee, Wis. M . . S . .
Allis Co., Louis, Milwaukee, Wis. M . . S . .
American Elec. Motor Co., Cedarburg, Wis. M . . . . .
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M . . . .
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S . .
R-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago F S U
Bogue Elec. Co., Chas. J., 132 King, New York M . . . .
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O. M F . . . .
Burke Elec. Co., Erie, Pa. M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 813 Lafayette, Toledo, O. . . F . . . .
Century Elec. Co., 1806 Pine, St. Louis, Mo. M F S . .
Chandeysson Elec. Co., St. Louis, Mo. M . . S . .
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. M . . . . .
Cleveland Armature Wks., 4735 St. Clair Ave., Cleveland, O. M . . S . .
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.

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Cushman Elec. Co., Concord N. H. M F S . .
Day-Fan Electric Co., Dept. A, Dayton, O. . . . F S . .
Diehl Mfg. Co., Elizabeth, N. J. M F S . .
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. . . . . S . .
Dumore Co., 35 16th, Racine, Wis. . . . . F . . U
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn. M . . . .
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. . . . . S . .
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J. M . . S . .
Emerson Electric Mfg. Co., 2014 Washington Ave., St. Louis, Mo. M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich. M . . S . .
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill. M F . . . .
Fidelity Elec. Co., Lancaster, Pa. M F S U
Fitzgerald Mfg. Co., Torrington, Conn. . . . F . . . .
Fynn Welchsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. F . . S . .
General Elec. Co., Schenectady, N. Y. M F S U
Gilbert Co., A. C., New Haven, Conn. . . F . . U
Hamilton Beach Mfg. Co., Racine, Wis. . . F S U
Hobart Bros. Co., Troy, O. M . . S . .
Holtzer-Cabot Elec. Co., 125 Amory, Boston M F S . .
Howell Elec. Motors Co., Howell, Mich. M . . S . .
Ideal Elec. & Mfg. Co., Mansfield, O. M . . S . .
Imperial Electric Co., Akron, O. M . . S . .
Janette Mfg. Co., 556 W. Monroe, Chicago . . F S . .
Jantz & Leist Elec. Co., Cincinnati, O. M F . . . .
Jeannin Electric Co., Fassett & N. Y. C. R. R., Toledo, O. M F S . .
Kendrick & Davis Co., Lebanon, N. H. . . F . . . .
Kimble Elec. Co., 634 N. Western Ave., Chicago M . . S U
Knapp Elec., Inc., Portchester, N. Y. . . F S U
Leland Elec. Co., Dayton, O. . . . F . . . .
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio M . . S . .
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O. M . . . . .
Mando Co., 911 State Tower Bldg., Syracuse, N. Y. (6-12-40 Volt only) . . . F . . . .
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. . . F . . . .
Marble-Card Elec. Co., Gladstone, Mich. M . . . . .
Master Electric Co., Dayton, O. M F S . .
MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. . . F S . .
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
North East Elec. Co., Rochester, N. Y. . . F . . U
Northwestern Mfg. Co., 480 Clinton, Milwaukee M . . . . .
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio . . . F S . .
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M . . . . .
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. M . . S . .
Reynolds Electric Co., 2650 W. Congress, Chicago . . F S . .
Robbins & Myers, Inc., Springfield, O. M F S U
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J. M . . S . .
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal. M . . S . .
Stow Mfg. Co., Binghamton, N. Y. M F S U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass. M F S U
Sunlight Electrical Mfg. Co., Warren, O. . . . F S . .
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O. M . . S . .
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa. M F S . .
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles M . . S . .
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. M . . S . .
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. M F S U
Walter Elec. Mfg. Co., Norfolk, Va. M . . S . .
Watson. See Allis Co., Louis.
Weico Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S . .
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S . .
Willey-Wray Elec. Co., 1522 Central Parkway, Cincinnati, O. M . . S . .
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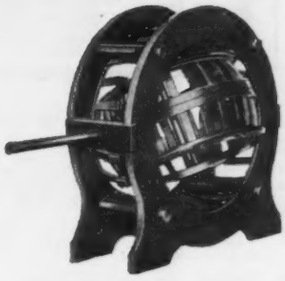

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Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.
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Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Waterbury Button Co., Waterbury, Conn.

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Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
National-Harris Wire Co., Newark, N. J.
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United States Nickel Co., New Brunswick, N. J.

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Ferracute Machine Co., Bridgeton, N. J.

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OSCILLOSCOPES. See Instruments, Laboratory Standard

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Despatch Oven Co., 622 Knight, S. E., Minneapolis, Minn.
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Devine Mfg. Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
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Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Mihoo Co., 717 Sycamore, Cincinnati, O.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
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Stokes Machine Co., F. J., 5926 Tabor Rd. (Oiney). Philadelphia.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thelco. See Freas Thermo Elec. Co.
Westinghouse Elec. & Mfg. Co., Mansfield, O
Young Bros. Co., 6523 Mack Ave., Detroit, Mich.

OXIDES, Battery. See Chemicals, Battery.

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Federal Metallic Packing Co., Wakefield, Mass.
Holed-Tite Packing, Inc., 100 E. 42nd, New York, N. Y.
Packtite. See Federal Metallic Packing Co.

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KEY
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Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing ..... See L

Acme White Lead & Color Wks., 3250 St. Aubin Ave., Detroit, Mich. L
Ajax. See Sherwin-Williams Co.
Alaks See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Lastite Co., 3166 Lincoln Ave., Chicago.. P L
American Wurtzilite Co., Builders Bldg., Chicago .. P
Antakwa Co., 1329 Mohawk, Chicago, Ill. ..... P
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. ... L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
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Atom Chemical Co., 96 E. 10th, New York, N. Y. L

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Berry Bros., Leib & Wight, Detroit, Mich. ..... V ...
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V ...
Biwaz Corp., 208 S. La Salle, Chicago, Ill. ..... P ..
Bradley-Hurtz Co., 2620 S. Dearborn, Chicago, Ill. ... L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P ..
Carboloid Products Corp., 15 Park Row, New York. V P ..
Celeron Co., Div. of Continental-Diamond Fibre
Chadeloid Chemical Co., 75 E 45th, New York. V ...
Co., Bridgeport, Pa. ..... V ...
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P ..
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V ...
Comulac. See Martindale Elec. Co.
Day & Co., James B., 1872 Clybourn Ave. Chicago, Ill. ..... P L
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P ..
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. .. P ..
Durez. See General Plastics.
Eastman Kodak Co., Rochester, N. Y. L
Eclipse Paint & Mfg. Co., Cleveland, O. ..... P ..
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York. ... L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O. L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O. ..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Five Point. See American Wurtzilite Co.
Franche & Co., 440 Orleans, Chicago, Ill. L
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. ..... V P ..
General Plastics, Inc., 69 Walck Rd., N. Tonawanda, N. Y. ..... V ...
Georges Co., P. D., 4153 Bingham Ave., St. Louis, Mo ..... V ...
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. ..... V P L
H. B. See Mass & Waldstein Co.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P ..
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O. ..... V P ..
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P ..
Lucote. See Lucas & Co., John.
Mass & Waldstein, 438 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P ..
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O. ..... V ...
Mawalac. See Mass & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V ...
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. ... L
O'Brien Varnish Co., South Bend, Ind. ..... V P L
Ohmlac Refining Co., 140 S. Dearborn, Chicago, Ill. .. P ..
Opex. See Sherwin-Williams Co.
Orite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. ... L
Peerless. See Mass & Waldstein Co.
Prozlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Reliable Leather Dressing Co., 42 Crescent, Long Island City, N. Y. ..... V ...
Republic Varnish Co., 200 Thomas, Newark, N. J. V ...
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P ..
Rockbestine. See Rockbestos Products Corp.
Rockbestos Products Corp., New Haven, Conn..... V ...
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y..... V P ..
Schorndorfer, Ferbert, 12815 Elmwood Ave., Cleveland, O. ..... V P ..
Sherwin-Williams Co., Cleveland, O. ..... V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo ..... V P ..
Standard Flexible Comp. Co., 1213 Franklin Trust Bldg., Philadelphia, Pa. ..... V P ..
Standard Insulation Co., Rutherford, N. J. ..... V ...
Standard Lacquer Co., 621 Broadway, New York, N. Y. L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P ..
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. ..... V ...

Toch Bros., 443 4th Ave., New York. ..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. ..... V ...
2098. See Mitchell-Rand Mfg. Co.
Varflex Corp., Rome, N. Y. ..... V ...
Voltas Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
Vulcan-Lastite. See American Lastite Co.
Walker Co., Henry V., 17 John St., New York. ... L
Waipole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P ..
Zapon Co., Stamford, Conn. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. ... L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Chicago Rawhide Mfg Co., 1301 Elston Ave., Chicago, Ill.
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New York & Penn Co., 200 5th Ave., New York, N. Y.
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Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Rogers Paper Mfg. Co., So. Manchester, Conn.
Special Paper Mfg. Co., 96 Reade, New York, N. Y.
Strype, Fred C., 140 Lafayette, New York, N. Y.
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Union Paper & Twine Co., 116 St. Clair Ave., N. W., Cleveland, O.
Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn.

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Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
National Vulcanized Fibre Co., Wilmington, Del.
White Supply Co., 4347 Duncan, St. Louis, Mo.

PENS, Scorching
Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
Post Elec. Co., 7 E. 44th, New York, N. Y.
Stylectric. See Post Electric Co.

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Asam Wright. See Asam Bros.
Capital Novelty Co., Lincoln, Neb.
Cummings Co., B. F., 4740 Ravenswood Park, Chicago, Ill.
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Seovil Mfg. Co., Waterbury, Conn.

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General Electric Co., Schenectady, N. Y.
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg. Co.
National Carbon Co., New York, N. Y.
Photion Instrument Corp., 574 Southern Blvd., New York.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Visitron. See G-M Laboratories, Inc.
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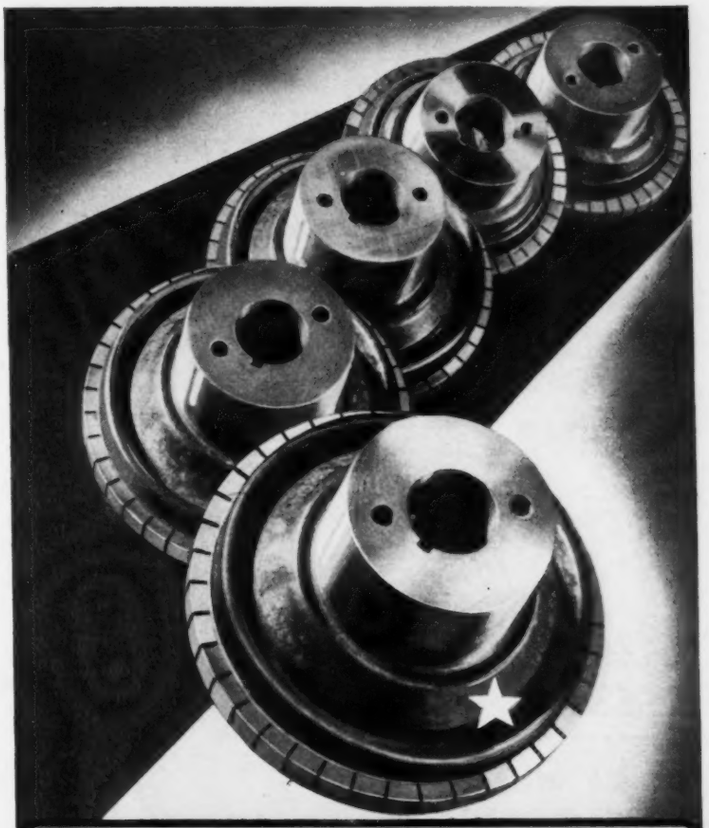

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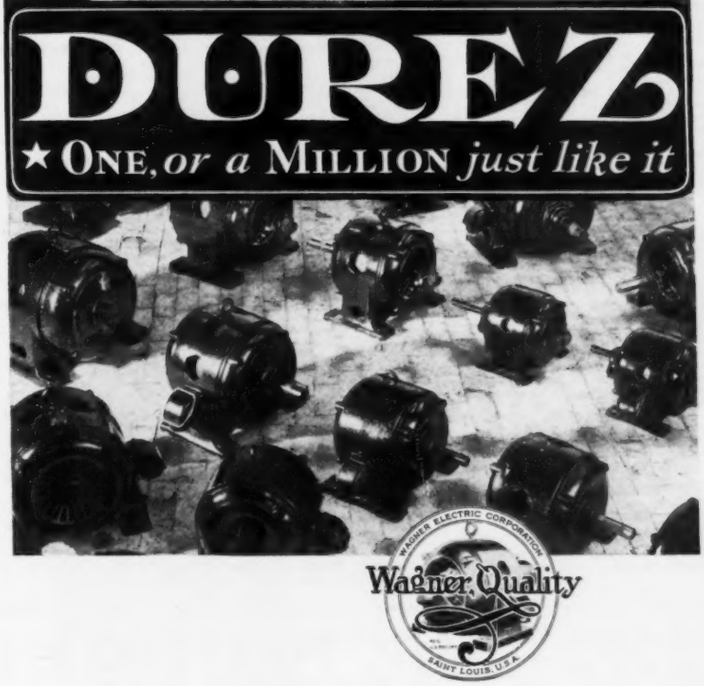

PHOTOMETERS, Lamp Testing
Riddle, James G., 1211 Arch, Philadelphia, Pa.
Foote, Pierson & Co., 75 Hudson, Newark, N. J.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
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Mathews. See Foote, Pierson & Co.
National Lamp Wks of G. E. Co., Cleveland, O.
PICK-UPS, TALKING MACHINE. See Loud Speakers
PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners
PINIONS. See Gears and Pinions.
PINION PULLERS. See Pullers, Armature Shaft.
PLASTICS. See Molded Insulation.
PLATES, Name. See Name Plates; Also Decalcomanis
Fixture Outlets. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.

PLATES, Storage Battery
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Champion. See Englert Mfg. Co.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Hemrick, Inc., 555 W. 52nd St., New York, N. Y.
New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

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Burke Elec. Co., Erie, Pa.
Chandeysson Elec. Co., St. Louis, Mo.
Connecticut Dynamoe Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 522 Newell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
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Optimus. See Hanson-Van Winkle & Munning Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
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Amaloy. See American Machine & Foundry Co.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Atlantic Chemical Co., Coit, Irvington, N. J.
Diamond Chrome. See U. S. Chromium Corp.
Duro Chrome. See General Chromium Corp.
General Chromium Corp., 3230 Bellevue Ave., Detroit, Mich. (Chromium Plate.)
Ideal Plating & Polishing Co., 55 Branford, Newark, N. J.
Metals Coating Co. of America, 495 N. Third, Philadelphia, Pa.
Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich.
Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
United Chromium, Inc., 51 E. 42d, New York, N. Y.
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)
U. S. Chromium Corp., Wilkinsburg Sta., Pittsburgh, Pa.

PLATINUM,
Sheet, Rod, Tubing, Wire.
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.
PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment
A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anzlite Elec. Co., Fort Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Arre-Grip. See Arrow Elec.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bee-Ell Elec. Mfg. Co., 79 Mercer, New York, N. Y.
Belden Mfg. Co., 2310 B. S. Western Ave., Chicago, Ill (Special Soft Rubber Plug Furnished with Belden Cords)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 33 Union Place, Hartford, Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products.
Circle F Mfg. Co., Trenton, N. J.
Colts Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., Dept. ER4, 50 Hall, Brooklyn, N. Y
Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.

CONTACT POINTS AND THERMOSTATIC METAL

BAKER Contact Points are made with the thought constantly in mind that, above all, contact points must function with unvarying reliability. We make them of platinum, iridio-platinum, silver and special alloys. Our thermostatic metal is made for high and for low temperatures. Baker Non-Rusting Thermostatic metal is for use where contact with steam or hot water is part of the problem.

BAKER & CO., INC.
54 Austin St. Newark, N. J.

Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
York, N. Y.
Fitzall. See Rodale Mfg. Co.
Gaynor Elec. Co., Inc., Stratford Ave., Bridgeport, Conn.
GE-Flex. See General Electric Co.
General Electric Co., Section W-234, Bridgeport, Conn. (Special Soft Rubber Plug furnished with G. E. Cords.)
Globe Metal Mfg. Co., 2122 E. Hazzard, Philadelphia, Pa
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hectach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Iona Co., Los Angeles, Cal.
Iffy. See Esler Elec. Mfg. Co.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Quartap. See Connecticut Elec. Mfg. Co.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Resco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 30 Church, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York
Un-X-Ld. See Speedway Elec'l Mfg. Co.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshire. See Iona Co.
Yankee. See Beaver Mfg. Co.
POCKET METERS. See Instruments, Pocket.

POINTS, Contact
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec Co., Hartford, Conn.
Independent Contact Mfg. Co., 545 39th, Union City N. J. (Tungsten.)
Interstate Products Corp., 29 Commercial, Newark, N. J (Platinum and Silver.)
Kirk Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y (Platinum.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)
POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Bushings. See Bushings, Box & Cabinet.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes
Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metach Refractories Co., East Liverpool, Ohio
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J
Washington Porcelain Co., Washington, N. J.
Woolley, Inc., W. Douglas, East Liverpool, O.

POROUS CUPS
Unglazed earthenware cups for primary (wet) batteries
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio

POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa
Gray Bros., Plano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn
POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.
PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation
Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Elmes Engrg. Works, Chas. F., 230 N. Morgan, Chicago.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
Farquhar Co., A. B., York, Pa.
French Oil Mill Machinery Co., Piqua, O.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5926 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding
Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching
Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y
Loshbough-Jordan Tool & Machine Co., Elkhart, Ind.
Peck, Stow & Wilcox Co., Southington, Conn
Rockford Iron Works, 846 Ray, Rockford, Ill.
PRISMS, Chandelier. See Crystals, Chandelier
PROJECTOR LENSES. See Lenses.

Everything in
PORCELAIN
Wet, Dry, Cast and Jiggered Processes
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East Liverpool, Ohio

Hardy Metal Contact Points
Give Service Equal or Superior to Platinum
Its unusually high resistance to oxidation makes Hardy Metal especially adaptable for heavy service, where arcing burns the life out of ordinary points.
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Mercer Porcelain Co., Inc., Trenton, N. J.
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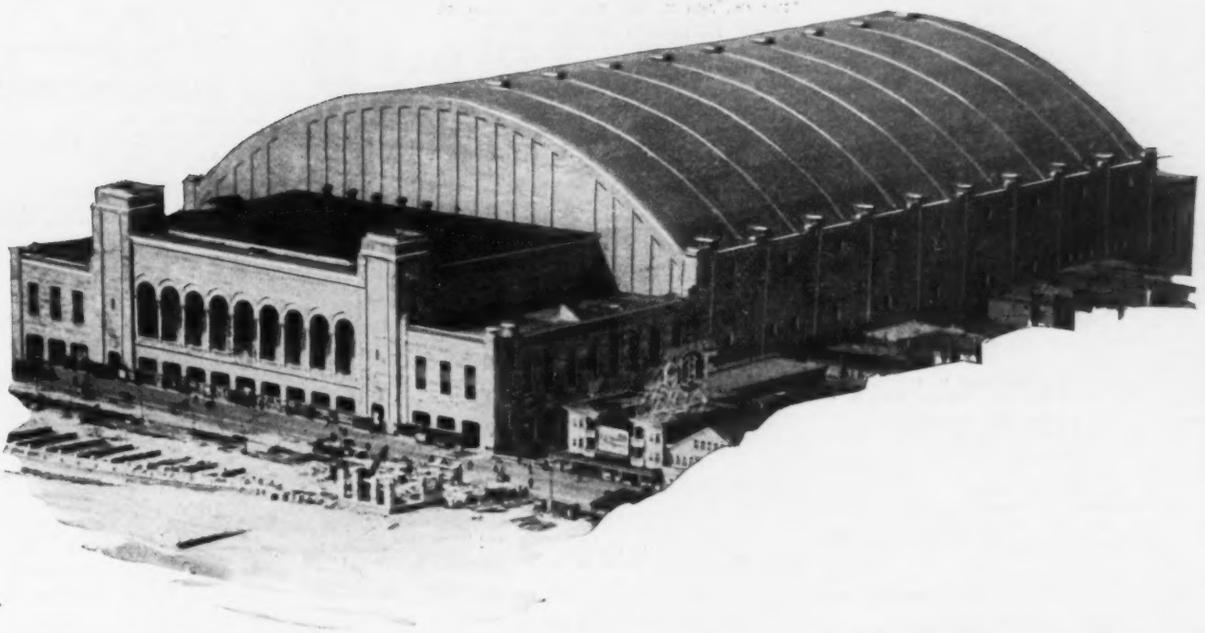

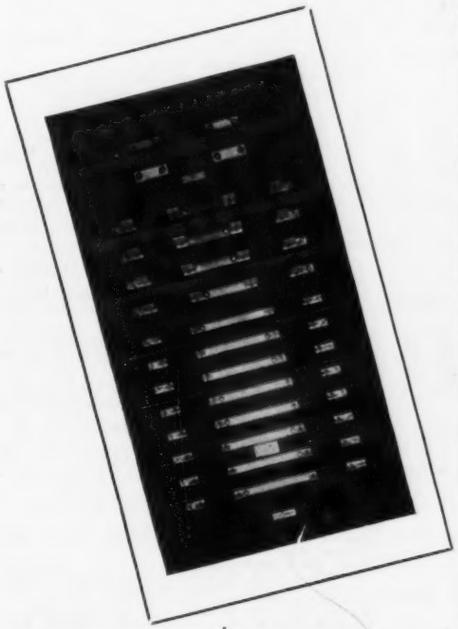

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AMBLER ASBESTOS PRODUCTS

¶ The Atlantic City Convention Hall which opened with the N. E. L. A. Convention last week is not only the largest in the world, but the most perfectly equipped. ¶ A 22,000 volt substation serves the mammoth auditorium. Perfect insulation is assured in this powerful installation by the use of Ambler Ebonized and 3-D Asbestos Lumber for switchboards, flash barriers and cell compartment doors.

Asbestos Shingle, Slate & Sheathing Co.

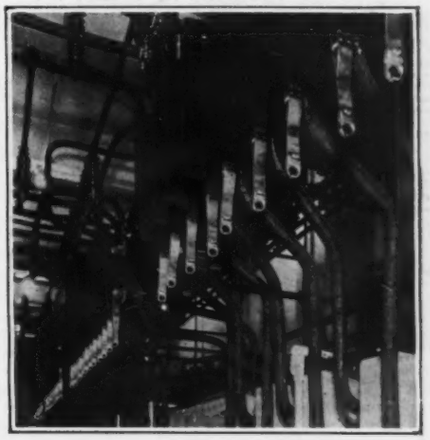
AMBLER, PENNSYLVANIA

At the upper left is one of the 60 Ambler Ebonized Asbestos Lumber panels on the main floor of Convention Hall serving D.C. and A.C. to all exhibition booths.

Lower left—One of the rows of cell compartment doors made of Ambler Asbestos Lumber; 162 in the substation.

Right—A battery of arc barriers; there are 100 of these in the installation.

Electrical Contractors: Fischback & Moore Philadelphia, Pa.



PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph. 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition

General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Elec. Corp., 756 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1820 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.

Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J.
Amperite Rheostat. See Radiall Co.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn.
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See De Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec Co., 1505 W. 15th, Chicago.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Columbia Metal Products Co., 360 E. Grand Ave., Chicago.
Concertone. See Chicago-Jefferson Fuse.
Connecteralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Anable & Rawson, Long Island City, N. Y.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
DeForest Radio Co., Jersey City, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 342 Madison av., New York.
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.

Fast Co., John E., 3982 Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filtrola. See All-American Mohawk Corp.
Fiechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hamilton-Sangamo Corp.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Harmonik. See Karas Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (TRF Kits.)
Heath & Co., Geo. W., 260 First Ave., Newark, N. J.
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Ify-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
J-M-P. Mfg. Co., 3329 Fond du Lac Ave., Milwaukee, Wis.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Kilograd. See Pilot Elec. Mfg. Co.
Kroblack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireless Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Melco-Supreme. See De Jur-Amsco Corp.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrand. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill (Resistance.)
Orthometric. See Karas Elec. Co.
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol See Wireless Radio Corp.
Perry Elec'l Resistor Corp., 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Protectoralds. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Conewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Recentor Co.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent). Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.

S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Submariner. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telon Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Toroid. See All American Mohawk Corp.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultra Vario. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Electro Chemical Corp., 30 W. 15th, New York.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Elec. Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels etc.

Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Radio Hardware Co., 135 Grand, New York.
Bonzo. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport Conn.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Cabelug. See Jones, Howard B.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Veau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio
Tubestat. See Muter Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J.
Cable Radio Tube Corp., 80 Union Square, New York, N. Y.

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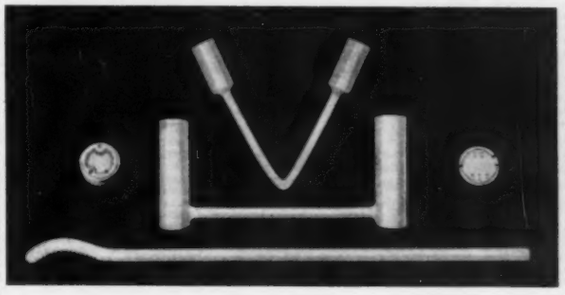

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RADIO RECTIFIER TUBES—Continued

Ceco Mfg. Co., 702 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Eveready Raytheon. See National Carbon Co.
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hygrade Lamp Co., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
La Salle Radio Corp., Div. of Matchless Elec. Co., 1500 N. Ogden Ave., Chicago, Ill.
Manhattan Elecl. Supply Co., 190 Sixth Ave., New York.
National Carbon Co., New York, N. Y.
Neptron. See Hygrade Lamp Co.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Perryman Electric Co., 33 W. 60th, New York, N. Y.
Radio-Victor Corp. of America, 233 Broadway, New York.
Revall Mfg. Co., 71 Euclid Bldg., Cleveland, O.
Sonatron Tube Co., 1020 S. Central Park Ave., Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.

RADIO TRANSFORMERS. See Radio Circuit Components.

RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.

RADIO TUBE BASES. See Radio Molded Parts.

RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Brach Mfg. Co., L. S., Newark, N. J.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Rica. See Birnbach Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.

RAWHIDE GEARS. See Gears & Pinions, Rawhide.

READING LAMP BASES. See Bases, Reading Lamp.

REAMERS, Pipe. See Stocks, Dies and Reamers.

RECEPTACLES, Lamp. See Sockets and Receptacles

RECEPTACLES, Plug, Heavy Duty

KEY

Battery Charging ..... See B
Floor Boxes ..... See F
Welding ..... See W
Machine Tool ..... See W
Watertight, Marine, Mine ..... See M
Car Trailer Connection ..... See C
Extension ..... See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 13 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. B

Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. B W
Hesser Co., W. F., 76 Greenwich, New York, N. Y. W M E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
NePage McKenny Co., Seven Front, Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio. W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 30 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. Y. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 1417 Sansom, Philadelphia F E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Zale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.

REDUCERS, Socket. See Socket Reducers.

REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

ABolite Reflector Co., 7500 Sherman Ave., Cleveland, O
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Duniap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbellte Art Products Co., 140 N. Robey, Chicago, Ill
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Oamed. See Overbaugh & Ayers.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.

REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
American Refrigerator Corp., Peru, Ind.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectriCE Corp., Belding, Mich
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 206 Lexington Ave., New York
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co
Dry-Air. See Baldwin Refrigerator Co.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 236 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Klean Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.

Beginning on page 59 Hirsch tells of

Electrical Uses of Graphite

Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Corp., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Plymetl. See Haskelite Mfg. Co.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Teletherm Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Basel Mfg. Co., 911 Mulberry, Kansas City, Mo.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston.
Cook Elec. Co., 2700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Fireside. See Quincy Stove Mfg. Co.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Heat Control Corp., 1207 Race, Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill
Protectostat. See Minneapolis-Honeywell Reflector Regulator Co.
Quincy Stove Mfg. Co., Quincy, Ill.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sheer Co., H. M., Quincy, Ill.
Simplex Heat Regulator, 2938 Pillsbury Ave., Minneapolis.
Snapon. See Tagliabue Mfg. Co.
Souder-Hornsby Co., Tamaqua, Pa.
Sure Fire. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Cramblet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
Wilcolator Co., Newark, N. J.
Wilson-Maxelin Co., 383 Concord Ave., New York, N. Y.

REGULATORS, Voltage

Ward-Leonard Electric Co., Mount Vernon, N. Y.
Rotor. See Ward-Leonard Electric Co.

RELAYS

(See also Circuit Breakers and Thermostats.)

Benjamin Elec. Mfg. Co., Des Plaines, Ill
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Duneo. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Struthers Dunn, Inc., 1133 Race, Philadelphia, Pa.
Wilcolator Co., Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Lautz Mfg. Co., 245 N. J. R.R. Ave., Newark, N. J.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill

RESISTORS. See Units, Rods & Grids.

RESURFACERS, Commutator. See Stones, Commutator, also Tools, Commutator Truing.

REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS,
Motor-Controlling. See Controllers, also Rheostats
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

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Battery Charging ..... See R
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Meter Testing (Laboratory) ..... See Y
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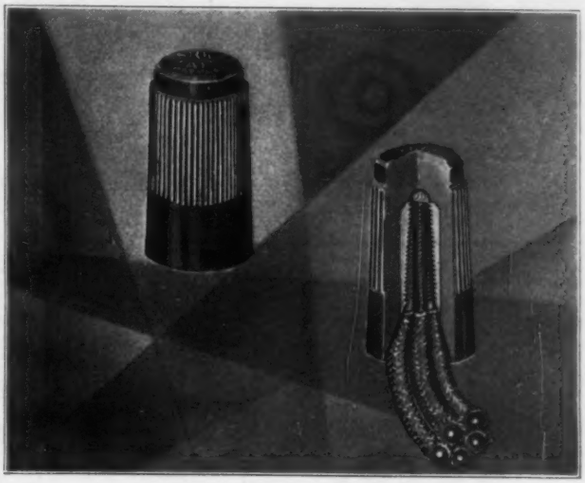

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Biddle, James G., 1211 Arch, Philadelphia . . . . . A
Brach Mfg. Corp., L. S., Newark, N. J.
(Radio Battery Control.) . . . . . B
Bradleystat. See Allen-Bradley Co.
Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O. . . . . P
Controlite. see Ward Leonard Elec. Co.
Crown Rheostat & Supply Co., 1908 Maypole Ave., West Chicago, Ill. . . . . P
Cutler-Hammer, Inc. 1288 St. Paul Ave., Milwaukee, Wis. . . . . F B D . . . L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. . . . . F
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. . . . . F
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. . . . . B
General Electric Co., Schenectady, N. Y. F . . . L
Hanson-Van Winkle-Munning Co., Matawan, N. J. . . . . P
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. . . . . D
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. . . . D . . M . .
Knoeller Elec. Co., De Pere, Wis. . . . . F
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago. . . . . F B D . . M L
Optimus. See Hanson-Van Winkle-Munning Co.
Robertson, Leo F., 536 W. 22nd, New York, N. Y. . . . . M
Rubicon Co., 29 W. Sixth, Philadelphia, Pa. L
Schaefer Bros. Co., 1059 W. 11th, Chicago . . B . . . . .
Simplicity. See Cutler-Hammer Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.. F . . . . . .
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y. . . . . F . . D . . M . .
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. . . . . F . . . . . M . .

RINGS Seal. See Packing.

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Chase Brass & Copper Co., Waterbury, Conn.
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Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

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Aetna Rubber Co., 815 E. 79th, Cleveland, O.
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Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave. New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

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Goodrich Rubber Co., B. F., Akron, O.
Republic Rubber Co., Youngstown, O.
Sun Rubber Co., Barberton, O.

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RUBBER, Sponge

Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Ashland, O.

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RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
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SALTS, Battery. See Chemicals, Battery.
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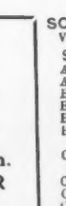

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Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
American Metal Wks., 4865 Stanton Ave., Philadelphia, Pa.
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Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Celoron Co., Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hanson, Einar R., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis
Interstate Products Corp., 29 Commercial, Newark, N. J.
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Shimer & Sons, Samuel J., Milton, Pa.
Steiner & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eleco Tool & Screw Corp., Rockford, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Esterly & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hamrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 630 West Jackson Blvd., Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia Pa. (Silk.)

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Spray Finishing Fundamentals

on page 38

Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.
R. D Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

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Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 18th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

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Wilson Co., H. A., 97 Chestnut, Newark, N. J.
SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Mejdex Insulation, Slate; Soapstone.

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Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.
SLEEVE-BEARINGS. See Bearings and Bushings
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1255 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.
SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Kirchberger & Co., Inc., 1425 37th, Brooklyn, N. J.
Lin-Stun. See Westinghouse.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain Attachments

Chain Links, Chain Adjusters, Acorns, Extensions, Insulated Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insr.

SOCKET REDUCERS

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Section W-234 Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.
SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

A. B. C. See Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. ..... W
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A

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PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.

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for Electrical
Purposes, Natural
Black, Oil Finish
Quarries:
Monson, Maine
Office, Portland, Maine

Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C . . . . P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport. ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M . . K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. ..... A W . . . . . .
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C . . . . . .
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C . . . . . B . .
Gaynor Elec. Co., Bridgeport, Conn. .....
General Elec. Co., Section W-234 Merchandise Dept., Bridgeport, Conn. ..... M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. ..... W . . . . . .
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Lovlin Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K . . P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Molded Socket Corp., Railroad, Pa. ..... K . . . . . .
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John L., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. ..... W . . . . . A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 50 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemon Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 2709 Powelton Ave., Philadelphia, Pa. ..... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. ..... A
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Waleo. See Leiser & Co., W. A

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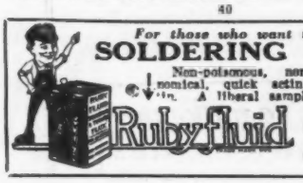
Fair Haven Vermont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Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P . . . .
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Aluminum Solder Corp. of America, 730 Fifth Ave., New York, N. Y.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Solderlume. See Aluminum Solder Corp. of America.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., Newark, N. J.
SOLENOIDS. See Coils, Finished.

SOLDERING

Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Anchor. See Garden City Laboratory.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brutner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 300 W. Adams, Chicago, Ill.
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Leveridge, Inc., Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammoniac.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., 133 Hoboken Ave., Jersey City, N. J. (Fluids, Salts, Paste).
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Smarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa. (Paste.)
Tinol. See American Solder & Flux Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex. R.
Yankee. See Leveridge, Inc., Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.

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"Burrows" Therapeutic Lamp
"Williams" Commutator Dressing
"Graustark" Line of Lighting Fixtures
"Vesodore" Cigar Lighters
"Defiance" Cigarette Lighter
"Sal Co. 176" Lamps
"Splendida" Electric Iron
"Electron" Heating Pad
"Blaisdell" Automatic Electric Cigar Lighter
"L. R. Co." Receptacles
"Lily-Wilson" Vacuum Cleaner
"Packard" Vacuum Cleaner
"Perkins" Siren
"Flint" Waffle Iron
"Columbus-Universal" Electric Vacuum Cleaner and Floor Polisher
"Pioneer" House Pump
"Trio-Dynamik" Radio Receiving Sets
"Lotan" Solder

Manufacturers of Electric Incinerators. Manufacturers of Electric Lacing Machine for Lacing Lamp Shades. Manufacturers of Steel Collapsible Barrels for post hole digging.

Replies from our readers to any of these inquiries will be greatly appreciated by ELECTRICAL MANUFACTURING, Printing Crafts Bldg., 461 Eighth Ave., New York, N. Y.

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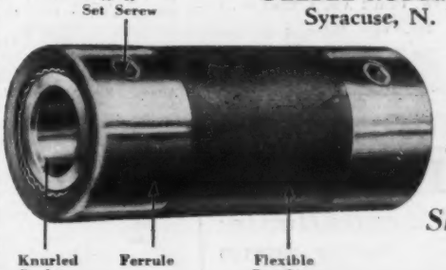

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American Beauty. See American Elecl. Heater Co.
American Elecl. Heater Co., Detroit, Mich.
B-D. See Bleadon-Dun Co.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., 402 N. Chestnut, Havenna, Ohio.
Betay Hons. See Central Flatiron Mfg. Co.
Bleadon-Dun Co., 2300 Warren Ave., Chicago, Ill.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., Inc., 135 W. 17th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper).
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lotan. See Simplex Flux & Solder Co. of America.
Lucifer. See Jones Point Tool & Elec. Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., Howell & Tyler Sts., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio. See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Simplex Flux & Solder Co. of America, 1965 E. 66th, Cleveland, O.
Superior Elec. Products Corp., 1300 S. 13th, St. Louis, Mo.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec Heating Co., 225 Varick, New York, N. Y.
Waara Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator
(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
SOLENOIDS. See Coils
SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.
SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS
Airway. See Chicago Utilities Corp.
Babco. See Simons Paint Spray Brush Co.
Beach Air Brush Co., Willard C., Harrison, N. J.
Chicago Utilities Corp., 3120 Carroll Ave., Chicago, Ill.
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Eclipse Air Brush Co., 79 Orange, Newark, N. J.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Sprayers, Inc., 87-28 130th, Long Island City, N. Y.
Ideal Air Brush Mfg. Co., 293 Lafayette, New York, N. Y.
Kellogg Mfg. Co., 97 Humboldt, Rochester, N. Y.
Koch Bros. Mfg. Co., 2339 Nelson, Chicago, Ill.
K B. See Koch Bros. Mfg. Co.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1911 Diversey Parkway, Chicago, Ill.
Pioneer Air Compressor Co., 176 Grand, New York, N. Y.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill
Spray-All. See United States Air Compressor Co., 5300 Harvard Ave., Cleveland, Ohio.
Sprayit. See Electric Sprayit Co.
United States Air Compressor Co., 5300 Howard Ave., Cleveland, O.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.
SPREADERS, COIL & LOOP. See Winding Machines. Armature & Field Coil.

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Advance Spring & Wire Co., Carroll Ave. & Wood St., Chicago.
Barnes-Gibson-Raymond, Inc., 6400 Miller Ave., Detroit, Mich.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.

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Coiled wire springs; special shapes from brass, phosphor bronze, chrome vanadium, music, hard drawn or oil tempered wire. Also Cadmium plated springs.
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Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Hunter Pressed Steel Co., Landsdale, Pa.
Newcomb Spring Corp., 234 46th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.
STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel
Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small
Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Eureka Tool & Machine Co., Newark, N. J
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Quadrigs Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 63 E. 131st St., New York, N. Y.

STANDS, Armature
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet
Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago
Ludlum Steel Co., Watervliet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

STEEL SHEETS
Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh
Armco. See American Rolling Mill Co.
Armelec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Poleiec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O
Tranelec. See Empire Steel Corp.
Unilov. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va
STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers
Hall-Will, Inc., Erie, Pa.
Red-E-Hail. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator
Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 613 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1130 South Michigan Ave., Chicago.
STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL
(Hot and Cold Roll).
Acme Steel Co., 2840 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
American Tube & Stamping Plant (Stanley Wks.) Bridgeport, Conn. (Hot & Cold.)
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Erie, Pa. (Hot & Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

STRIPPERS, Wire
Acme. See A. Laubscher.
Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hertman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 17005 Meigrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).
SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.
SWITCHBOARD OPALS. See Lenses.
SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.
SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap

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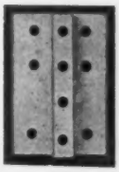

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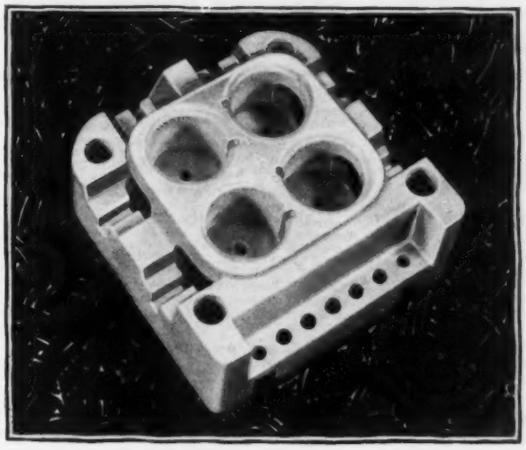

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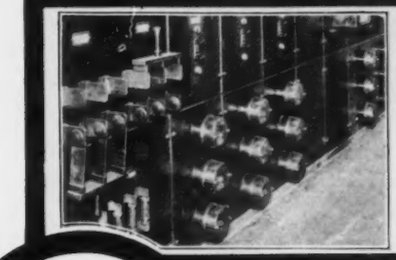
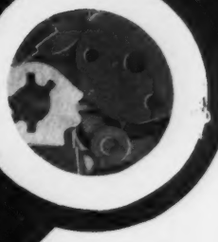

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SWITCH (Switches)—Continued
Starter Type. see Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 80 N. 12th St., St. Louis, Mo.
Manhattan Elec. Supply Co., 190 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite, See Frank W. Morse & Co.
Reliabls Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland
Sta-Rite. See Frank W. Mosse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Cooper Hewitt Electric Co., 883 Adams, Hoboken, N. J.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Febrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dall Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Lincoln Elec. Co., Coit Rd. & Kirby Ave., Cleveland, O.

Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
South Bend Current Controller Co., South Bend, Ind.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.	f					
Anylite Elec. Co., Ft. Wayne, Ind.					L	
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.	f	sp	P	R	L	F
Arrow Head. See Arrow Elec.						
Beaver Mfg. Co., 625 N. Third, Newark, N. J.	f	p	P			F
Best. See United States Elec. Mfg. Corp.						
Brascolite. See Guth & Co., Edwin.						
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f					
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.					L	F
Bryant Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F
B. S. Co. See Bridgeport Switch Co.						
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.						F
Circle F. Mfg. Co., Trenton, N. J.	f		P		L	F
Circle T. See Trumbull Elec. Mfg. Co.						
Connecticut Elec. Mfg. Co., Bridgeport, Conn.		p	P	R	L	F
Crouse-Hinds Co., Syracuse, N. Y.					L	
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.			P		L	
Diamond H. See Hart Mfg. Co.						
Dugle. See Bryant Elec. Co.						
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.						F
Gaynor Elec Co., Bridgeport, Conn.	f				L	
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn.	f	sp	P	R	L	F
Glo-Guide. See Bryant Elec. Co.						
Gold Star Push Switch. See Hart & Hegeman.						
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.						F
Hart Mfg. Co., Hartford, Conn.	f	sp	P	R	L	
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control)	f	sp	P	R	L	F
Hart. See Hart & Hegeman.						
H. & H. See Hart & Hegeman Mfg. Co.						
Hubbell, Inc., Harvey, Bridgeport, Conn.		sp			L	F
Jost. See Morse, Frank W.						
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.	f		P			
Leviton Mfg. Co., 226 Newell, Brooklyn						F
Levolier. See McGill Mfg. Co.						
McGill Mfg. Co., Valparaiso, Ind.	f				L	F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.					L	F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y.	s				R	
Morse Co., Frank W., 291 Congress, Boston			P			
National. See Standard Elec. Mfg. Co.						
New England. See Paulding, John L.						
Nutmeg. See Hubbell, Harvey, Inc.						
Operite. See Morse Co., Frank W.						
Pass & Seymour, Solvay Sts., Syracuse, N. Y.	f	sp	P		L	F
Paulding, John I. New Bedford, Mass.	f	s	P			
Pen Tap. See Beaver Mfg. Co.						
Perkins. See Bryant Elec. Co.						
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y.					L	
Pilotoggle. See Pilot Elec. Mfg. Co.						
Pullrite. See Morse, Frank W.						
Rodale Mfg. Co., 200 Hudson, New York	p					
Sears, Henry D., 80 Boylston, Boston	f	sp	P	R	L	F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.			P			
Snapit. See Marks Products Co.						
Spartan. See Bryant Elec. Co.						
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill.	f	s	P	R	L	
Trigle. See Bryant Elec. Co.						
Trumbull Elec. Mfg. Co., Plainville, Conn.	f	s	P	R	L	
Tumbolier. See Hart & Hegeman.						
Twi-Lite. See McGill Mfg. Co.						
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y.	f					
Victor. See Kell & Son, Francis.						
Weber. See Sears, Henry D.						
Workrite. See Morse, Frank W.						
Yankee. See Bryant Elec. Co.						

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank

Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.

Leader-Tranern Products Co., Decatur, Ill.
Outrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter F., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland, O.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Productimeter. See Durant Mfg. Co.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elect. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zernickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y.
(Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brocklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TAMPING TOOLS, COIL. See Tools, Commutator Truing.
TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

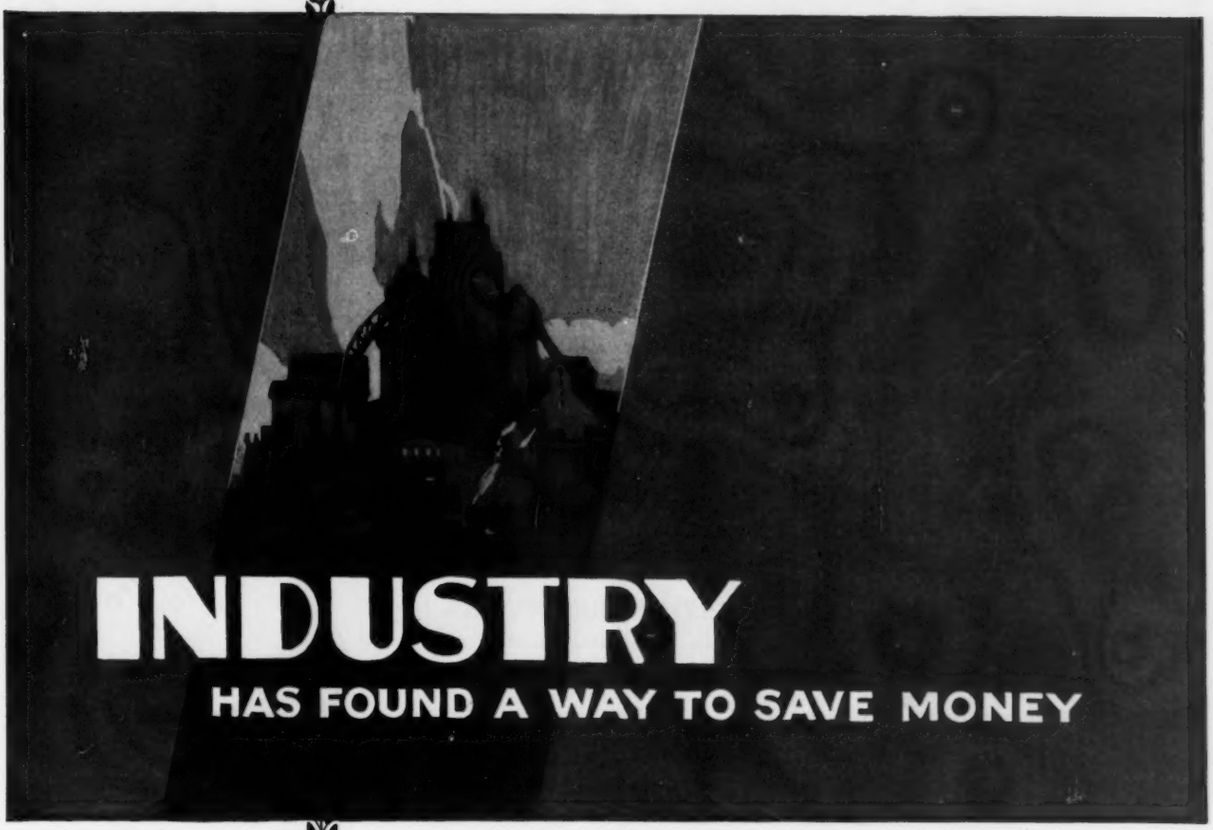
Tape, Sleeving, Webbing.
Alfalfa. See Burrell Belting Co.
Anchor Webbing Co., Nyo, Pawtucket, R. I. (Cotton, Silk.)
Awebco. See Anchor Webbing Co.
Bermaline. See Burrell Belting Co.
Burrell Belting Co., 413 S. Hermitage Ave., Chicago, Ill.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.



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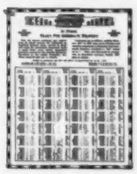

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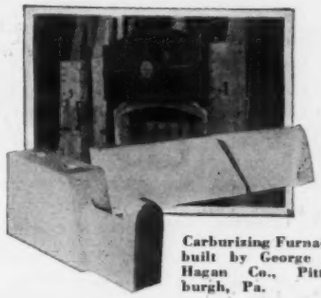

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TAPE, Rubber and Friction—Continued
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Acklurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dunlee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Hoidtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Ireo. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relio. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis
2-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.
TAPS. See Stocks, Dies and Reamers.
TENSION DEVICES, Coil Wire. See Racks, Wire Reel

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-In-One. See Ohio Parts Co.
Barep-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shurs. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind

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Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.
TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery)
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co
Wilson Co., H. A., Newark, N. J.

THERMOSTATS

American Thermostat Co., 226 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston,
Crambiett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5003 Carnegie Ave., Cleveland, O.
Electric Maid. See Hanknscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Freas Thermo-Electric Co., 1206 S. Grove, Irvington, N. J.
Globe Mfg. Co., Battle Creek, Mich.
Hanknscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.

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Our No. 2800 metal for temperatures up to 1500° F.
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Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Manhattan Elec'l. Supply Co., 190 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teepie Co., L. R., 540 E. 9th, Portland, Ore.
Thermolectric. See Bishop & Babcock Sales Co.
Thermosnap. See Spencer Thermostat Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 230 N. Morgan, Chicago, Ill.
TIME SWITCHES. See Switches, Time.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.
TINSEL. See Wire, Insulated.

TINSEL, Cord and Thread

Belden Mfg. Co., 2310 B S. Western Ave., Chicago, Ill.
Diamond Braiding Mills, Chicago Heights, Chicago, Ill.
Hy-Sil Mfg. Co., Revere, Mass.
Kilo Co., 2 E. 23rd, New York, N. Y.
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Montgomery, A. J. R., Windsor Locks, Conn.
Springfield Wire & Tinsel Co., Springfield, Mass.

TIPS, Cord

Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Coil Tamping

Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Staysalite. See Klein & Sons, Mathias.
TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS

Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

TRANSFORMERS, Low and Intermediate Voltage

For Oil Burners, Gas Tube Signs, and other special purposes.
American Bosch Magneto Corp., Springfield, Mass.
American Transformer Co., Newark, N. J.
Campbell Elec. Mfg. Co., Lynn, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elec'l. Supply Co., 190 Sixth Ave., New York.
Sorgel Electric Co., 89 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago, Ill.
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.
TRANSMISSION DRIVES. See Chain, Transmission.

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Segur. See Electric Service Supplies Co.

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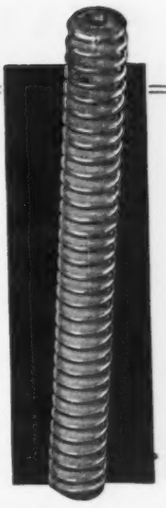

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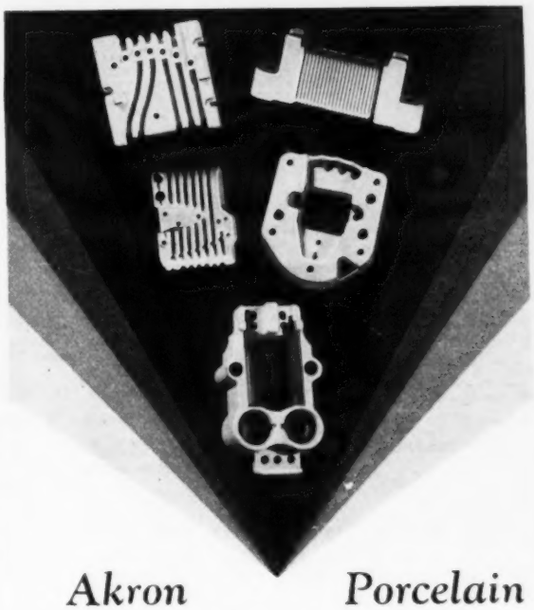

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TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Electric Products Corp., Pittsburgh, Pa.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic

(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Corp., Inc., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Eisler Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.
TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.
TURNING TOOLS, COMMUTATOR. See Tools, Commutator Truing.

TWINE, Armature Winding; Torpedo Cord

Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.
UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.
UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator.

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Cairod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darlc Co., 35 E. 21st, New York, N. Y.
Di-El-lte. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgerest. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Willow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa. (Radio Resistance.)
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Resistance Laboratories, Inc., 20 W. 22nd, New York, N. Y.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 900 Hudson, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N. Y.
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 421 First Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.
VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Crane Co., Michigan Ave. S., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Naceo Mfg. Co., 1482 Clara Ave., St. Louis, Mo.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-It. See Ziach Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Ziach Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
VARNISH. See Paint, Varnish, Lacquer.

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VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.
WASHERS, FIBRE. See Fibre.

WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock

Keystone. See Positive Lock Washer Co.
National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

WASHERS, Metallic

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.
WATTMETERS. See Instruments.

WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound.....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W . . . .
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago. . . . S . .
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Biwax Corp., 208 S. La Salle, Chicago, Ill. . . . W S . .
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S . .
Clifton Mfg. Co., 65 Brookside Ave., Boston. C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . . W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . . .
Di Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn. . . . . W . . . .
Geoge Co., P. A., 4153 Bingham Ave., St. Louis. W . . . .
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. . . . . W S . .
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich. . . . . W . . . .
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York. . . . . W . . . .
Knox & Morse Co., 80 Freeport, Boston, Mass. . . . . W S . .
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. . . . . W . . . .
Mitchell-Rand Mfg. Co., 19 Vesey, New York. . . . . W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind. . . . . W . . . .
National Wax Co., 189 W. Madison, Chicago, Ill. . . . S . .
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. . . . . W . . . .
Sherwin-Williams Co., Cleveland, O. . . . . W . . C
Standard Varnish Wks., 433 4th Av., New York. . W . . . .
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. . . . . W S . .
Star Porcelain Co., Trenton, N. J. . . . . W . . C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. . . . . W S . .
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. . . . . S . .
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y. . . . . W . . . .

WEDGE DRIVERS. See Tools, Cummutator.
WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 726 Washington, Buffalo.
Almanc. See Allan Mfg. & Welding Co., Inc.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago
Ames Co., 115 Ninth, Brooklyn, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.

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That is exactly what the Cooke Seal Ring now makes possible. No expensive packing to buy. No labor or shut-down time to install or renew. Equip your stuffing boxes with Cooke Seal Rings and forget that packing ever existed. Do this and you also create a joint which is absolutely leak-proof against any liquid or gas under pressure or vacuum, eliminate scored shafts, cut friction to almost nothing, prevent motor overload, save money. One of a dozen reasons why Cooke Seal Rings are being installed everywhere. If you have an oil seal problem we can solve it. Write us for details.

COOKE Seal Ring

46 N. Green Street
Chicago, Illinois
Dept. O

OHIO Torque Motors

Ohio Torque Motors are widely used to replace Solenoids in operating elevator controls, door opening appliances, brakes and similar devices.

The quiet operation, unfailing performance and economy of these motors make them especially desirable for this type of service.

Ohio Fractional Horse Power Torque Motors are made for 100%, 50%, 25% and 10% Locked Service conditions.

Full details and dimensions on request.

The Ohio Electric & Controller Co.
5905 Maurice Avenue
Cleveland, Ohio

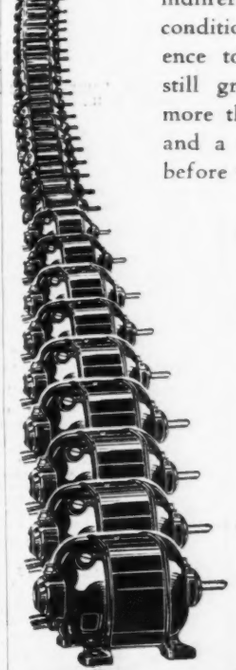
Also manufacturers of a complete line of Standard A.C. and D.C. Motors

Production

A new factory, modern in every way, flooded with daylight and laid out for straight line production supplants the old.

A new era begins, with the handicap of indifferently lighted and crowded factory conditions eliminated. Still closer adherence to sharply drawn working limits, still greater uniformity of parts, even more thorough inspection will prevail—and a finer finished product than ever before will result.

Equally important from a point of service—production will be increased better to care for the peak requirements of Leland customers, both present and future.



A. C. Repulsion Induction
D. C. Compound Wound
A. C. Polyphase
Interchangeability of Frames

The Leland Electric Co.
Dayton, Ohio.
U. S. A.

Leland

1/8 1/6 1/4 1/3 1/2 3/4 1

Motors

Body Conscious Employees

cannot produce up to their best

When profit depends upon machinery, an unprofitable machine is quickly junked.

Factory chairs are machines that either facilitate or hamper the work of the occupant. They either produce fatigue or reduce it, according to how well they fit the individual workers and the work.

Scientifically designed Royal "Seat of Production" Factory Chairs increase production, as they are adjustable to fit any worker.

Let us send you a handbook on the relation of fatigue to posture and its effect upon production.

A tired worker costs more than a good chair.

Adjustable Ranges

17" to 23"
21" to 27"
25" to 31"
28" to 34"

ROYAL
Seat of Production
FACTORY CHAIRS

Write To-day for Details

60-DAY TRIAL OFFER

ROYAL METAL MFG. CO.

Largest Manufacturers of Factory Chairs

1130 S. Michigan Blvd., CHICAGO

Magnet Wire
Electrical Cordage
Rubber Covered Wire
Office Wire
Annunciator Wire
Bare Flexible Copper
Braids and Cables

The Wheeler Insulated Wire Co.
Bridgeport, Conn.

–GILBY WIRE–
COMPANY

WILBUR B. DRIVER, President

Manufacturers of

RESISTANCE WIRES

—round and flat, fine wires, strip. Heat and acid-resisting castings. Special alloys. We can advantageously fill your requirements.

"TOPHET A" (*formerly SOLAR*) "TOPHET C" (*formerly Tophet*)
"CUPRON"

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WELDING AND CUTTING OUTFITS—Continued

Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 150 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Fegeral Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 10257 Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Cott Rd. and Kirby Ave., Cleveland
McAdams Co., J. C., New Britain, Conn.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit.
Taylor-Winfield Corp., Mahoning Ave., Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating

Brawley, T. R., 279 30th, Brooklyn, N. Y.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 177 New York Ave., Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Lyknu. See Fredericks Co.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Conron, Frederick M., 177 New York Ave., Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Bidlon Company, Frank, 253 A St., Boston, Mass.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6142 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord). Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding ..... See B
Copper Wire ..... See C
Iron Wire ..... See S
Phosphor Bronze ..... See R
Radio Bus Wire ..... See C
Resistance Wire ..... See R
Steel Wire ..... See S

Acme. See Alloy Metal Wire Co.

Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C B ..
American Brass Co., 25 Broadway, New York.
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C B ..
American Electrical Works (Phillipsdale), Providence, R. I. ..... C . . .
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C . . S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C . . S
Anaconda Wire & Cable Co., Sycamore, Ill..... C . . .
Anylite Elec. Co., Fort Wayne, Ind. ..... C . . .
Ballast. See Gilby Wire Co.
Baltimore Copper Mills (Div. of General Cable Corp.), Baltimore, Md. ..... C . . .
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago C . . S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. .... R . .
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn..... C . . .
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C . . .
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C . . S
Cornish Wire Co., 30 Church, New York, N. Y.. C . . .
Corwico. See Cornish Wire Co.
Crape. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C . . .
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 36 E. 20th, New York, N. Y... C . . .
Detroit Insulated Wire Co., Detroit, Mich..... C . . .
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J..... . . B . .
Electrun. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.. . . . .
Gilby Wire Co., Riverside Ave., Newark, N. J... . . B
Goldmark Co., James, 83 Warren, New York.. C . . .
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C . . .
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich. .... B . .
Hudson Wire Co., Ossining, N. Y..... C B . .
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C . . S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C . . .
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. .... B . .
Nehring Electrical Works, De Kalb, Ill. ..... C . . .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn..... . . . S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. ..... C . . .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C . . .
Race. See Ross Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C . . .
Roebling's Sons Co., John A., Trenton, N. J..... C . . S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C . . .
Ross Wire Co., 69 Bath, Providence, R. I..... C . . .
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silicrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y..... C . . .
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C . . .
Super-Insulated Wire Co., Plymouth, Mass. ..... C . . .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C . . .

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WINDERS Spaced Resistor In Tube or Cord Types

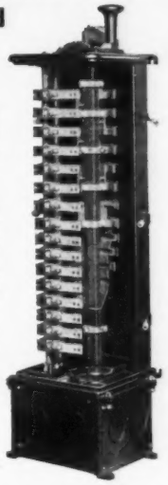
Also for Dynamic Coils; Armatures; Radio and Electrical Transformers.
Vitreous Enamel Electric Ovens

FREDERICK M. CONRAN
177 New York Ave., Newark, N. J.

UNION

The Most Complete Line of Drum Controllers in the World

Frame Construction



Unbreakable malleable iron head and bottom. Stamp steel back and sides welded to head and bottom. Removable top plate. Pressed steel front cover—weather proof.

Operating levers of the rotating type are equipped with latches in the "off" position. This applies to the reversing drum. Non-reversing drums have no latch. Rope wheel self-centering, or straight line lever drive can be furnished in place of rotating lever.

The removable top plate, and the bottom, are fitted with Renewable Arguto Oilless Bearings.

Conduit boxes are designed for mounting under bottom of drum.

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934 Juneau Ave., Milwaukee, Wis.
Manufacturers of
Electric Motor Control Apparatus

Also Associated Manufacturer with, and Eastern Distributor for
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Magnetic Motor Control Apparatus

Easy to Install

It isn't necessary to make long runs to fireproof vaults or to outside of buildings when installing Sorgel Transformers. Being air-cooled, they can be installed easily and economically right where the change of voltage is wanted, or any other convenient place inside of buildings.

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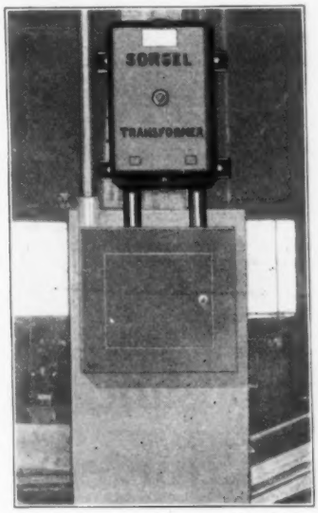
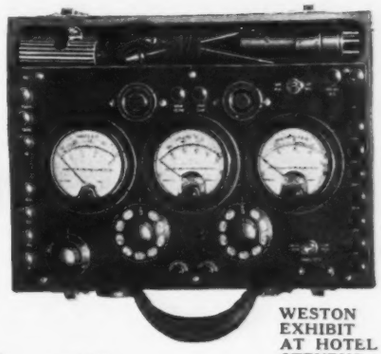
SORGEL
Air-Cooled
Transformers
With Conduit Connections
No Extra Fittings Required
Made in sizes
1/4 to 50 KVA.
Single-phase, 2-phase and 3-phase
110,220,440,550 V.
Transformers Designed for Special Applications
Ask for Descriptive Literature



Sorgel Electric Co., *89 W. Water St., Milwaukee, Wis.*



WESTON EXHIBIT AT HOTEL STEVENS

The New RADIO SET TESTER

See it at the R. M. A. Convention

THE radio industry is familiar with the Weston Model 537 Radio Set Tester—for A. C. and D. C. receivers. Service men hailed it with great acclaim a year ago, noting its many advantages over the Weston Model 519—for D. C. only.

And NOW—here is another great advance — the Weston Model 547 — incorporating many additional features to meet the service testing requirements of radio's latest developments. And there have been many since the last R. M. A. Convention. But with this NEW SET TESTER radio servicing is still further simplified, even taking into account the number of new tubes, sets and circuits. Space won't permit description here—nor would words alone do this new set tester justice. You must see it for yourself—operate it—try to think up some service problem it can't solve. Try as you will the Model 547 will give you a quick and accurate answer every time. Convenient — complete — light and rugged. Handsome in appearance — and it will yield you handsome profits. It will increase your business and your prestige. YOU CAN BANK ON IT!

This instrument has many outstanding service features. But first of all it is a Weston—assuring you exquisite workmanship and complete service reliability. It is provided with three instruments—all 3¼" diameter and furnished with bakelite cases. Carrying case, removable cover, panel and fittings are also made of sturdy bakelite.

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582 Frelinghuysen Ave. Newark, N. J.

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Drawing and Re-drawing Mill Equipment for Small Wires.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Conn.

WIRE, Insulated

KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord.....See B
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See B
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See B
Lamp Cord .....See B
Magnet Wire .....See M
Rubber Covered Wire & Cable..See B
Stove Wire .....See B
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. B
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Enamaled Silk, Cotton ..... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y..... A .. M ..
American Copper Products Corp., 233 Broadway, New York, N. Y.....
American Electrical Works (Phillipsdale), Providence, R. I..... M
American Enameled Magnet Wire Co., Muskegon, Mich. ..... M
American Insulated Wire & Cable Co. Div. of General Cable Co., 954 W. 21st, Chicago, Ill. ..... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I..... B F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerize. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., Sycamore, Ill. ..... R W .. A .. M
Anaconda Wire & Cable Co., Marinq Wire Branch, Muskegon, Mich. (Silk, Enamel) ..... M
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled..... A .. M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R
Chicago, Ill. ..... R F H A T M
Belden Mfg. Co., 2310B S. Western Ave., Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y..... R F .....
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H .. ..
Bradford, Kyle & Co., Plymouth, Mass. ..... M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... B F H .....
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R ..... T ..
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 36 E. 20th, New York. R .....
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... B F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R ..... T
Diamond Braiding Mills, Chicago Heights R F H .. . M
Di-Noburn. See Diamond Braiding Mill.
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R .. H .....
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind..... M
Ducatto. See Dudlo Mfg. Co.
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Durco. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R .....
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. ..... F .....
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. ..... T .
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. ..... H .....
General Elec. Co., Section W-235, Merchandise Dept., Bridgeport, Conn.... B F H .. . M

Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet ..... A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R ..... T ..
Grimshaw. See New York Ins.
Hatex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. ..... R F H .. T ..
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa.... R F .. A . ..
Holyoke Co., 621 Broadway, New York.. R .. . A .. M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H .....
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R .....
Kilo, Co., 2 E. 23d, New York..... T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. ..... T
Lowell Insulated Wire Co., Lowell, Mass. R F H .....
Liberty. See Nat. Metal Molding.
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass..... R ..... T ..
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass. ..... M
Montgomery Co., J. R., Windsor Locks, Conn. ..... T ..
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa..... R F H A T M
N. E. See Goldmark Co., James.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R .....
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also Okocord. See Okonite Co.
Okonite Co., Passaic, N. J..... R .....
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F .....
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa..... H A T ..
Phillips Wire Co., Pawtucket, R. I..... R .....
Providence Insulated Wire Co., Providence R F H A ...
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn..... R .. H .. T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. ..... M
Rome Wire Co., Rome, N. Y..... R F H .. T M
Ross Wire Co., 69 Bath, Providence, R. I.. R .....
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill..... T ..
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H .....
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R .....
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F .....
Shield. See Ansonia Elec'l Co.
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala..... M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. .... H .....
Standard Insulated Wire Co., Westfield, Mass. ..... R .. H .....
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T ..
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R .....
Strand & Sweet Mfg. Co., Winsted, Conn. ..... M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R .....
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F .....
United States Rubber Co., 1790 Broadway, New York, N. Y..... R .. H A T ..
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. ..... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H .. T ..
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R .. H .... M

WIRE, Steel Flat

Steel Coating for Armored Conductor
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill

Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines, Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines .....See A
Braiding Machines .....See B
Bunching Machines .....See S
Covering Machines .....See I
Insulating Machines .....See I
Insulation Straining Machines.....See I
Measuring Machines .....See M
Park Cabling Machines.....See A
Saturating Tanks .....See F
Spooling Machines .....See U
Stranding Machines .....See S
Tinning Tanks .....See F
Winding Reels .....See U

Adamson Machine Co., Akron, Ohio.. I A .....
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A .... S U
Breguet. See American Insulating
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. ..... M .. U ..
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I ..... U ..
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. ..... M .. U ..
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U ..
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I .....
Sleeper & Hartley, Inc., Worcester, Mass. ..... A .... S U
Terkelson Machine Co., 326 A St., Boston, Mass. ..... M .....
Textile Machine Works, Reading, Pa. .... B .....
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn..... A ..... U F
Utility Mfg. Co., Cudahy, Wis..... I .....
Wardwell Braiding Machine Co., Central Falls, R. I..... B .....
Wire Machinery Corp. of Am., New Haven, Conn. ..... M S U ..
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
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New England Butt Co., 344 Pearl, Providence, R. I.

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Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers, Wire Insulation.

WIRE WRAPPING MACHINES

Terzelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

YARN AND THREAD; Silk, Cotton, Asbestos

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American Glanzstopf Corp., 180 Madison Ave., New York, N. Y.
Asbestos Fibre Spinning Co., North Wales, Pa.
Commercial Rayon & Thread Co., 19 W. 21st, New York, N. Y.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
Franklin Rayon Corp., 86 Crary, Providence, R. I.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville Corp., New York, N. Y. (Asbestos.)
Keasbey & Mattison, Ambler, Pa.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dore Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

Horse Head. See New Jersey Zinc Sales Co.
New Jersey Zinc Sales Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co., 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeles Zinc Co., La Salle, Ill.
New Jersey Zinc Sales Co., 160 Front, New York, N. Y.

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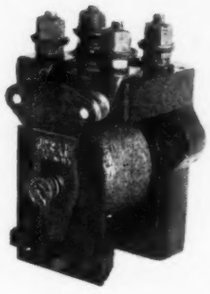

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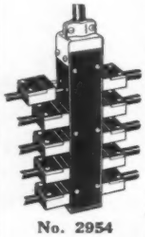

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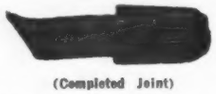

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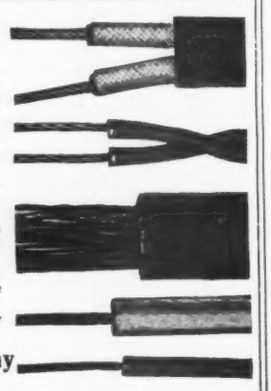

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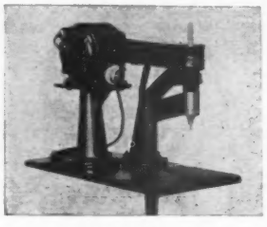

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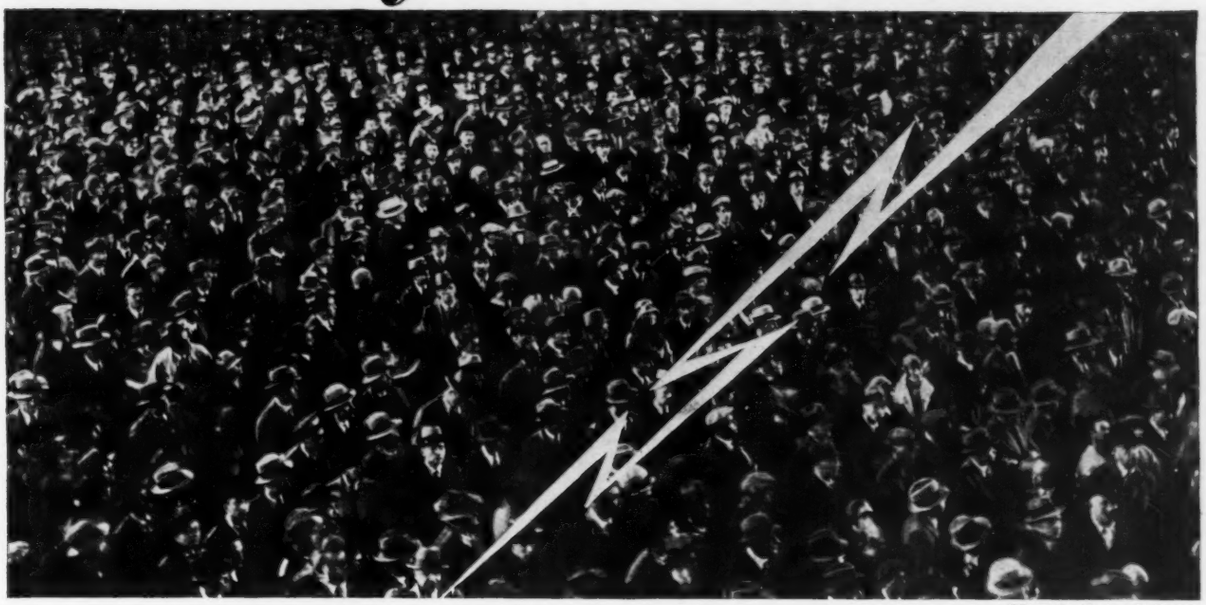

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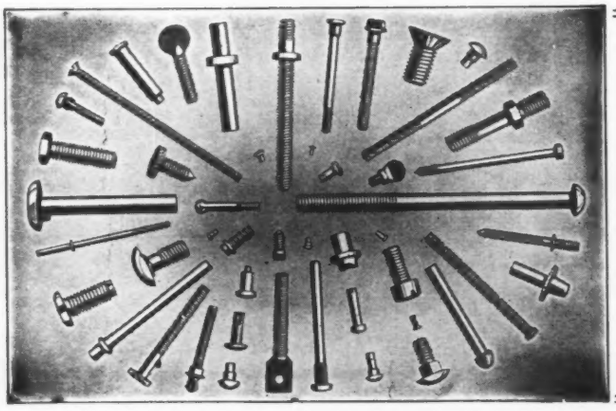

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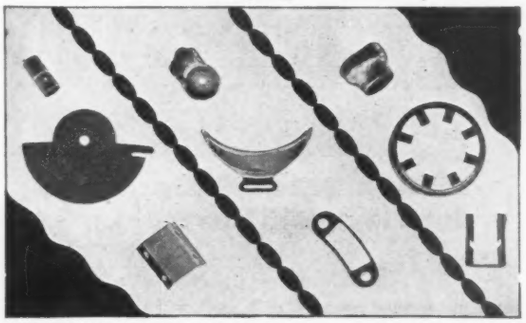

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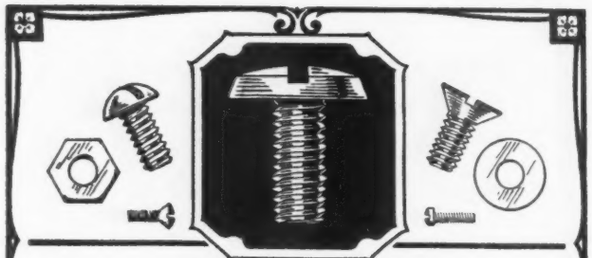

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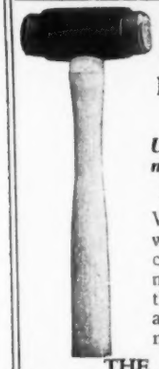

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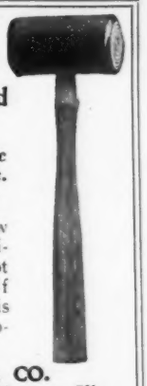

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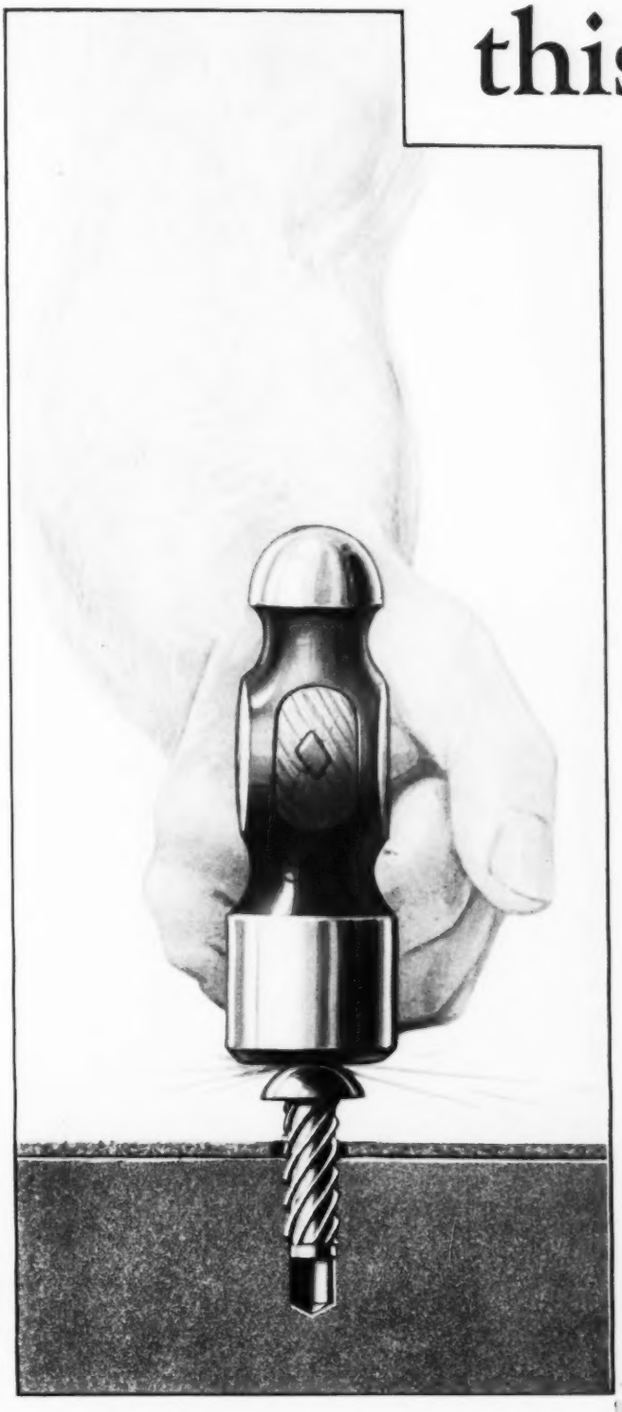

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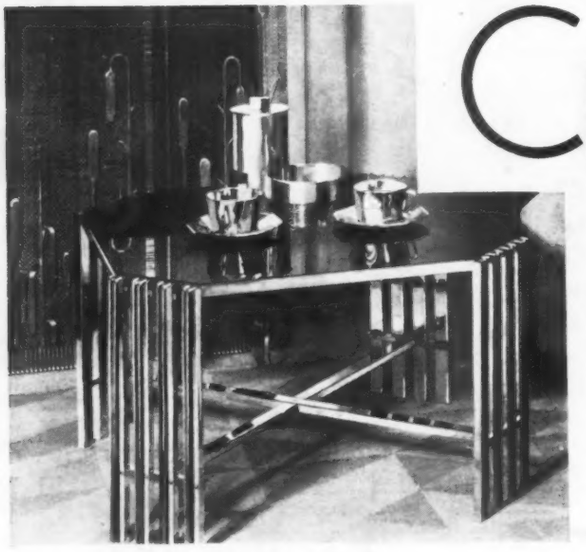

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